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VOL. 107 WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL
No. 2244 DECEMBER 10, 1959
Registered at the G.P.O. as a Newspaper Offices: John Adam House, John Adam St., London, W.C.2

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TRADE JOURNAL

Vol. 107. December 10, 1959 No. 2244

Established 1902
Incorporating
IRON & STEEL TRADES JOURNAL

Single copy 1s.; *by post* 1s. 4d. *Annual subscription: home* 52s. *abroad* 60s. *(prepaid)*

Editor:
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The FOUNDRY TRADE JOURNAL is the official organ of the British Steel Founders' Association; Association of Bronze & Brass Founders; the Light Metal Founders Association; Foundry Trades' Equipment & Supplies Association; and the National Society of Master Patternmakers.

AN INDUSTRIAL NEWSPAPERS PUBLICATION

Published Every Thursday by Industrial Newspapers, Limited

BARRINGTON HOOPER, C.B.E., *Chairman and Joint Managing Director*
F. BARRINGTON HOOPER, B.A., *Joint Managing Director and Commercial Director*
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JOHN ADAM HOUSE, 17-19, JOHN ADAM STREET, ADELPHI, LONDON, W.C.2

Telephone: Trafalgar 6171 *(Private Branch Exchange)*
Telegraphic Address: "Zacatecas, Rand, London"

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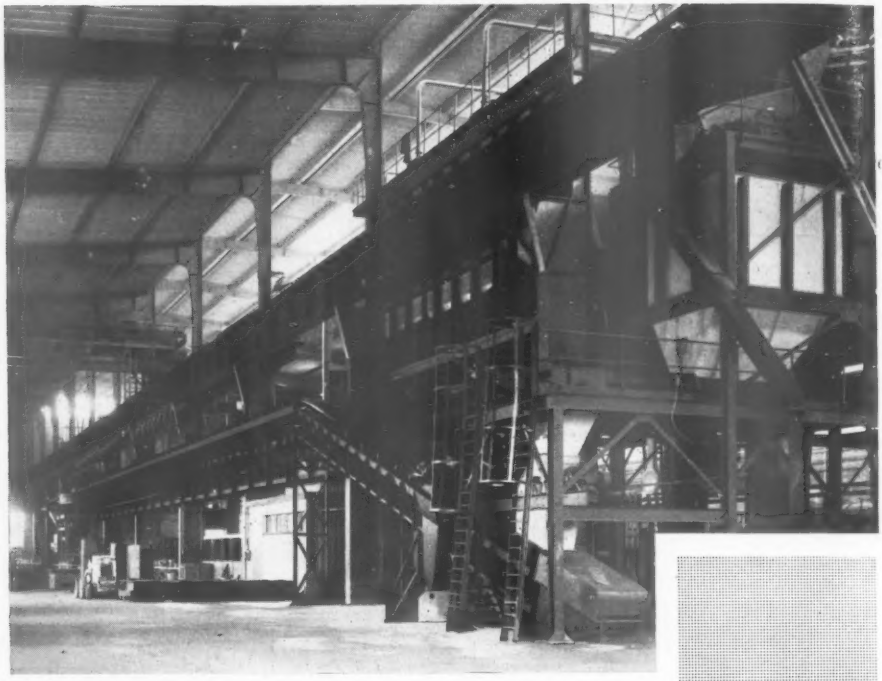

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A Large INGOT MOULD FOUNDRY with Modern Plant by August's LIMITED

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Vol. 107 DECEMBER 10, 1959 No. 2244

The Scandinavian Market

The Federation of British Industries has just published an interesting Report* of three conferences held to discuss the potentialities of the Scandinavian and Finnish markets. In it is expressed the concensus of opinion that there is insufficient realization as to the value of these markets—something like £284 millions last year. The buying capacity of the area is high and in Sweden, actually higher *per capita* than in the United Kingdom. Actually, the four Nordic countries bought over £14 *per capita* of British goods in 1958. It is pointed out that the Germans regard Scandinavia as their natural market, just in the same way as the UK regards New Zealand and Australia. Since the war, they have made great efforts to increase their sales in the Nordic area.

So far as foundry equipment is concerned, Swiss competition in the area is probably more marked than German. Much of the plant offered is based on American designs, but manufactured in Switzerland. These same types of plant are made in the UK—for sale in the home market and most of the Dominions, but *not* in Europe, because of agreements with the American principals. Good foundry equipment is also being made in Sweden, so that it is not merely Swiss and German competition that British suppliers meet. Under all these circumstances, British manufacturers have done reasonably well, especially considering that in pre-war days their participation in the market was virtually zero.

In recent times, there have been some direct sales of malleable castings to the Swedish automobile industry, consequent on the closing down of a local source of supply. By and large, however, these countries are so well serviced by their national foundry concerns that they have no obvious large market open to overseas castings suppliers. In fact, the foundry industries of Sweden and Denmark are successfully selling vitreous-enamelled hardware in the United Kingdom. With regard to castings incorporated in machinery, it is for UK engineers and machine-tool makers—*i.e.*, founders' customers—to study the potentials of the important markets in Scandinavia. Electrically-operated plant and appliances suggest themselves as being especially appropriate for study, as electric current is the major fuel now used, having almost entirely replaced the traditional woodpile. The markets are by no means homogeneous and each one needs a separate approach.

* UK Trade with Scandinavia and Finland. Published by the Federation of British Industries, 21, Tothill Street, London, S.W.1; price 4s. (presumably, plus postage).

German Symposium on S.-g. Iron

The *Verein Deutscher Giessereifachleute* (German Foundrymen's Technical Association) and the *Verein Deutscher Ingenieure* (German Engineers' Association) are jointly arranging a symposium on spheroidal-graphite cast iron on January 14 and 15, 1960, at Stuttgart-Bad Cannstatt, which will be combined with an exhibition of castings. The chair at the two-day meeting will be taken on alternate days by a member of the VDG and a member of the VDI respectively. The lectures, to be followed by discussions, will be held in the Great Kurhaus Hall. The programme will include:—

Thursday, January 14, *at* 2 *p.m.* (In the chair Dr. K. Bandow, Stuttgart.) Papers will be presented by Dr. H. Wiegand (Darmstadt) on "S.-g. Iron as Design Material"; Dr. E. Mortara (Milan) on "Applications of S.-g. Iron"; Mr. M. Grandpierre (Brebach, Saar) on "S.-g. Iron Pipes for Gas and Oil," and Mr. H. Dienelt (Hamburg) on "Corrosion Behaviour of S.-g. Iron at Elevated Temperatures and Applications in Coking Plants."

Friday, January 15, *at* 8.30 *a.m.* (In the chair, a member of the VDI.) The following papers will be presented:—"Austenitic S.-g. Iron—a New Material of Varied Properties," by Dr. A. B. Everest (London) and Dr. O. Nickel (Düsseldorf); "Fatigue Strength of S.-g. Iron," by Dr. J. Motz (Cologne); "Magnetic Properties of S.-g. Iron," by Dr. H. Dietrich (Krefeld); "User's Quality Requirements for S.-g. Iron," by Dr. H. Timmerbeil (Grevenbroich, North Rhine), and "Draft Specification DIN 1693 for S.-g. Iron—a Guidebook for its Application by the Designer," by Dr. H. Mühlberger (Frankfurt).

Dinner

BRITISH STEEL FOUNDERS' ASSOCIATION

The biennial dinner of the British Steel Founders' Association was held at Claridges Hotel, London, W.1, on December 2, Dr. C. J. Dadswell, the chairman of the Association, presiding. The loyal toast having been honoured, the "Steel Foundry Industry" was proposed by Sir Leslie Rowan, K.C.B., C.V.O., to which the chairman replied. Mr. C. H. Kain proposed the toast of "Our Guests," the reply being made by Mr. R. P. Morrison, Q.C. At the high table, in addition to the above, were the Rt. Hon. the Viscount Knollys, G.C.M.G.; Sir William Scott, O.B.E.; Mr. G. M. Menzies; Mr. L. Chapman, C.B.E.; Mr. T. W. McCullough, O.B.E.; Dr. R. Hunter; the Rt. Hon. Lord Clydesmuir; Mr. N. P. Newman, J.P.; Mr. A. C. Jennings, M.A. (Master of the Worshipful Company of Founders); Major R. Miles and Mr. F. A. Martin, O.B.E.

IT IS UNDERSTOOD that the Metal Box Company, Limited, is to build a large factory at Bulawayo. The cost is likely to be in the region of £200,000.

USUAL SEASONAL INCREASE in unemployed took place between mid-October and mid-November, the national percentage rising from 1.9 to 2.0. At 431,000 the unemployment figure is the highest since the end of May, but well below the level of November, 1958.

LOWEST TENDER for the supply of steelwork in connection with the construction of a dam at South Saskatchewan, Canada, has been supplied by the Cleveland Bridge & Engineering Company, Limited, Darlington. The company's bid of $2,690,000 (about £1,000,000) was for the supply of steel ring beams for five diversion tunnels.

Forthcoming Events

DECEMBER 15

Institute of British Foundrymen

Slough section: "Running and Gating of Castings," by W. W. Glick, 7.30 p.m., in the Lecture Theatre, High Duty Alloys, Limited.

DECEMBER 16

Institution of Production Engineers

Swansea section: "Lighting and Colour as an Aid to Production," by R. Davies, 7 p.m., at the Central Library, Swansea.

Institute of Fuel

London section: Symposium on the "Uses of Liquid-petroleum Gases," at the Institution of Civil Engineers, Great George Street, S.W.1 (details from secretary).

Institute of Welding

North London branch: Works visit to British Oxygen Company, Limited, Angel Road, London, N.18.

Institute of British Foundrymen

London branch: "Aluminium Castings," by J. Vickers, 7.30 p.m., at the Constitutional Club, Northumberland Avenue, W.C.2 (joint meeting with the London local section of the Institute of Metals).

DECEMBER 17

Institution of Plant Engineers

Blackburn branch: "Procedure to avoid Disputes in the Engineering Industry," by J. B. Norton, 7.30 p.m., in the Castle Hotel, Blackburn.

DECEMBER 18

Institute of British Foundrymen

Coventry section: "Review of the First Five Years' use of the CO$_2$ Process in British Foundries," by A. Tipper, 7.30 p.m., at the Coventry Technical College, Room A5.

Northampton section: Annual dinner, 7 p.m., at The Plough Hotel.

DECEMBER 19

Institute of British Foundrymen

Scottish branch: Dinner/dance (in association with the local section of the Institute of Metals) at the Grosvenor Restaurant, Garden Street, Glasgow.

Latest Foundry Statistics

Light-alloy Castings: For the first time, it is the Ministry of Aviation which announces the monthly production of light-alloy castings. The announcement covers August, and now this service is under new management, it is to be hoped that it will be speeded up, as the figures are invariably the last of the major foundry production totals to be received. During August, 1,392 tons of aluminium castings were made from sand moulds; 3,874 tons were made as gravity-die- and 1,447 tons as pressure-die-castings. The output of magnesium castings was 139 tons. With the exception of magnesium castings, production in this month was somewhat higher than the monthly averages.

Ironfounding: The Council of Ironfoundry Associations reporting on employment in iron foundries for the week ending October 3, states that the total number employed was 124,950, and of these 116,406 were males and 8,544 females. Although this shows an increase of 941 over the census taken on August 29, it is still 3,208 fewer than approximately a year ago.

THE 12 ADMINISTRATIVE UNITS of the High Authority of the ECSC, hitherto directly responsible to the executive body, have been replaced by the following seven departments:—General secretariat; administration and finance; economic and energy; market (coal); market (steel); labour problems, reorganization and development; and loan and investment. A number of highly-qualified experts in ECSC service will be called upon to act as "special counsellors."

Centrifugally-cast Steel Pipe and other Tubular Products*

Operations at Sandusky Foundry & Machine Company, in the USA

The manufacturing aspects of centrifugal-casting production are reviewed, and it is made evident that, by knowledge and control of numerous factors or variables, successful production can be readily obtained. It is demonstrated that pipe and other tubular products can be produced of good quality, comparable in soundness, mechanical properties, and fabricability to wrought metals of similar composition and heat-treatment. This reproducible high quality is mainly the result of a very high pressure of molten metal, induced by the action of centrifugal force, pressing against the solidifying metal to eliminate solidification shrinkage voids, as solidification advances inwards across the wall section of the casting. Since this account deals not only with the plant at Sandusky, but also with basic formulae and processes applicable to centrifugal casting generally, it provides a useful up-to-date guide for those new to the subject, and also gives a pointer to the great amount of progress which has recently been made in this field.

The Sandusky Foundry and Machine Company, Sandusky, Ohio, engages exclusively in production of centrifugally-cast cylinders and tubes. The individual-cast cylinders range in size from 50 to 64,000 lb. each in steel, and a maximum of 83,000 lb. each in the copper-base alloys. They are cast and machined from 7- to 54-in. o.d., and up to 33 ft. long, in a variety of alloys including heat- and corrosion-resistant stainless-steels, carbon steel, low-alloy steels, copper-base and nickel-base alloys.

Sandusky Foundry Equipment

High-frequency melting equipment is the mainstay of the foundry. By interchanging relatively inexpensive furnace-boxes in the melting stations, the production of a heat of any size in either ferrous alloys or copper-base alloys, from a few lb. up to the total maximum capacity of the induction furnace installation (44,000 lb.) is easily accomplished. Other melting equipment, supplying additional melting capacity when required, consists of three 13,000-lb. gas-fired rotary melting-furnaces for copper-base alloys, and an 11-ton direct-arc furnace for additional steel production. The induction-melting shop has covered pouring pits in front of the furnaces, with power control and switching panels set in the wall behind the furnaces. The moulds are kept vertical for ramming-in a one-inch thick lining of plastic refractory mix (see Fig. 1). After a furnace is tapped into a ladle, the metal is poured into a basin which is attached to a spout which directs the metal into the spinning mould. Fig. 2 shows the mould in position on the casting machine, containing a casting ready to be removed. In Fig. 3 the casting is being removed from the mould after vibration has loosened the refractory lining in the mould. After being cleaned and heat-treated, the castings are machined in a modern machine-shop.

In the first part of the following account, the problems and factors to be considered and controlled in producing centrifugal castings are considered. The second part deals with such items as the physical and mechanical properties, quality control and inspection tests, and also fabricability of centrifugally-cast low-alloy and stainless steels. Numerous comparisons are made between the properties of wrought metals and those of centrifugally-cast metals.

CENTRIFUGAL-CASTING PROCESS

Hollow cylindrical metal shapes such as pipe and vessels used in high-temperature and pressure applications are amenable to economical production by the true centrifugal-casting process.

General Features

The true centrifugal-casting process consists essentially of pouring molten metal into a horizontally-revolving cylindrical mould, by the action of which it is accelerated. The metal is held, by the centrifugal force developed, against the surface of the mould cavity, while solidifying. This method of centrifugally-casting hollow cylinders tends to eliminate solidification shrinkage microvoids during the period of metal solidification, rather than during hot-working operations, as is the case with similar hollow items forged to shape from statically-cast ingots.

Casting Machine

The centrifugal-casting machine (see Fig. 4) is in principle a simple arrangement, comprising:

(*a*) A cylindrical mould or case with driving-bands fastened to its outer surface near both ends;

(*b*) a set of two drive-rollers spaced the same distance apart as the bands on the mould—thus, the bands on the mould rest on the drive-rollers.

(*c*) A variable-speed motor-drive connected to the

* Prepared by James T. Gow for presentation at the annual power forum of the Philadelphia Section of the American Society of Mechanical Engineers. (Abridged)

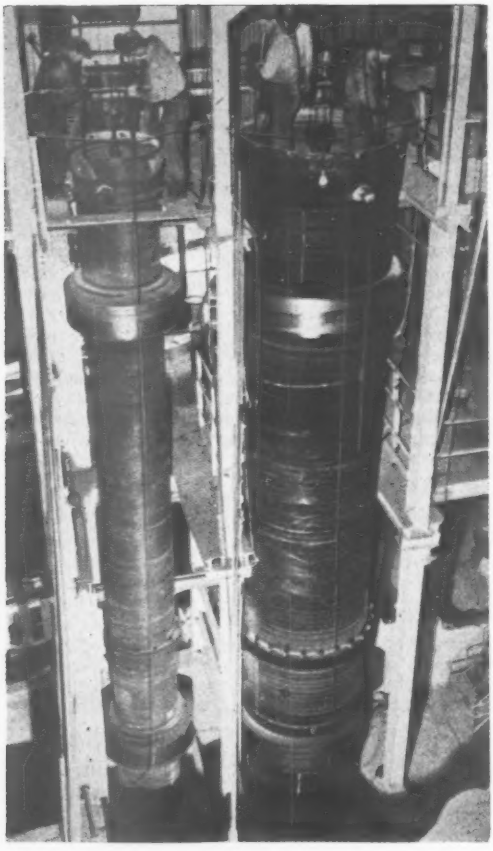


FIG. 1.—*Plastic refractory mix being rammed into two large moulds, arranged vertically, at the works of Sandusky Foundry and Machine Company, in Ohio, USA.*

drive shaft attached between a front and back drive-roller, and

(*d*) a pair of thrust-rollers which contact the front band on the mould.

Mould

The metal mould (see Fig. 5) into which the molten metal is poured is generally lined with either:

(*a*) a relatively thin layer of plastic-refractory moulding mix, which has been rammed in place, coated with a refractory wash, and then baked dry and hard, or

(*b*) a lighter covering of sprayed-on refractory material.

The type of lining used in a mould is largely dictated by economic considerations; however, grain-size differences attendant on different solidification rates are at times of importance.

Size Control

In making centrifugally-cast pipe, the mould is rotated with its axis in a horizontal position. A predetermined quantity of metal is then poured into it from a transfer ladle through a ceramic-lined pouring basin and spout, which is positioned at one end of the mould. The inside diameter, and the mould cavity, determine the outside diameter of the casting. Shrinkage, which is approximately 0.25 in. per ft. for steels, must also be taken into consideration when deciding the mould size. The wall thickness for a given diameter and length of casting is controlled by the quantity of metal poured into the mould. Therefore, each casting is poured with a predetermined weight of metal.

Speed of Rotation

In general, the mould is rotated at such a speed as to create a centrifugal force of the order of 75 times gravity at the centre of the wall thickness of the casting, but not less than 55 times gravity at the inner surface of the casting. Such conditions of spinning speed have generally been found to be optimum for rapid pickup and distribution of the molten metal, and for holding the molten metal in place during solidification under a sufficient pressure head to assure a well-fed metal section.

Solidification

Solidification of the casting begins at its outer surface, as a result of heat withdrawal by the contacting mould material. Solidification then gradually progresses inwards through the wall of the casting to the inner surface of the casting. Thus, during solidification of a centrifugal casting, there is a liquid head of metal under centrifugal pressure being applied to the solidifying metal, thereby feeding the solidification-shrinkage areas. This produces a casting with a high degree of soundness. However, some unsoundness, caused by solidification shrinkage, remains concentrated near the inner circumference of the rough casting, where the last of the metal solidifies. In order to make a casting suitable for applications requiring a clean, sound inner surface, this layer of feeder metal must be removed by boring.

Potential Defects

A brief insight is now given into the main factors to be considered and controlled in avoiding or minimizing such defects as: (*a*) Composition

TABLE 1.—*Variables influencing the Production of Good Castings.*

Metal Composition and Physical Properties
Fluidity and density of metal.
Chemical composition differences between start and completion of solidification.
Temperature and the extent of the temperature difference between the start and completion of solidification, *i.e.*, the solidification range.
Casting Size
Diameter, wall thickness and length.
Relation of mass of metal to cooling surface.
Mould Material
Heat capacity and conductivity of mould.
Mechanical properties of mould, expecially at high temperatures.
Properties of mould coating.
Casting Process
Spinning speed of mould.
Pouring temperature of metal.
Pouring rate.
Mould temperature.
Cooling conditions.

gradient across the wall section; (*b*) cracking or hot-tearing, either transverse or longitudinal; (*c*) circumferential lapping, and (*d*) segregation banding. A knowledge of the interrelated variables shown in Table 1 is essential.

Influence of Spinning Speed

Since these variables operate concurrently, it follows that a set of conditions found to be optimum for a particular casting, will not be suitable for different-sized castings of the same metal, or for castings in other alloys. Furthermore, even given other uniform conditions, the spinning speed of the mould has a considerable influence on the casting (see Table 2).

TABLE 2.—*Factors influenced by the Spinning Speed of the Mould*

(*a*) Mode and rate of metal pickup and flow along the length of the mould.
(*b*) Extent of the chilling action of the mould upon the layer of metal immediately in contact with the mould surface.
(*c*) Tendency towards structural uniformity, and the structural character of the solid metal.
(*d*) Pressure on the mould surface.
(*e*) Pressure gradient across the casting wall.
(*f*) Circumferential tension in the casting wall.

Variation of the other four casting-process variables mentioned in Table 1 will also alter factors (*a*) to (*c*) in Table 2.

The optimum speed of rotation is that which provides rapid pickup of the metal poured into the mould with minimum vibration in the casting machine. Such conditions tend to give a uniform structure free from pronounced segregation.

Metal Pickup

When molten metal is poured on to the surface of a rotating mould, the whole of it is not picked up immediately. Rotational velocity is imparted to it by virtue of the friction between the liquid metal and the mould. After the mould is covered, all succeeding metal will be accelerated by reason of internal friction between the liquid surface already spinning and the metal to be picked up. This creates an appreciable tendency to slippage. An increase in mould speed above that which allows of slipping and cascading, but below the critical vibration range, tends to reduce the metal grain-size. Also, the inner-surface quality improves as spinning speed increases.

Too low a rotational speed results in delayed pickup of metal on the mould wall, causing slipping, raining, or cascading of the metal inside the mould. This is conducive to segregation of different-density constituents in bands or zones; also, the cylindrical bore becomes rougher. This may also cause laps and entrapped oxides, if the slipping or cascading continues until the metal is nearly solidified.

Too high a rotational speed generally results in mould vibration, which causes a circumferential-line type of segregation banding. Excessive spinning speed can produce circumferential tension high enough to cause radial cracks or circumferential hot tears as the solidifying metal shrinks away from the mould wall.

With the optimum spinning speed, the metal will be picked up rapidly and held firmly to the mould wall without slipping or cascading. With

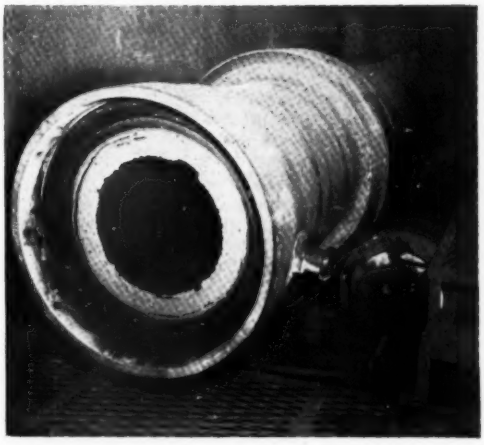
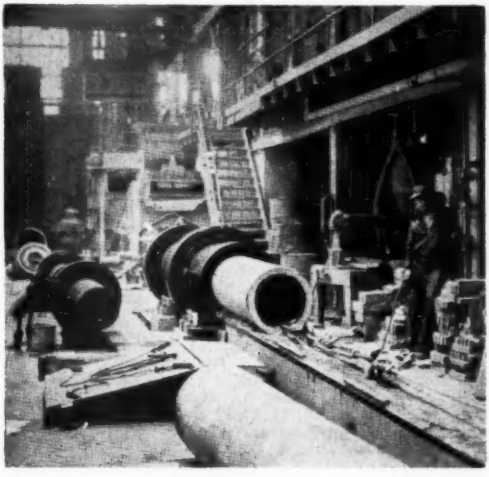


FIG. 2.—*Pipe mould, containing a solidified casting, in position on the casting machine; one of the driving rollers can be seen in the right foreground.*

the liquid metal in place, a pressure gradient is established radially across the wall thickness of the casting, as a result of the centrifugal action, which is very effective in cleansing the metal of non-metallic inclusions. This pressure is lowest at the inner surface, increasing to a maximum at the outside of the pipe. Since particles of different densities are subject to different pressures at a given rotational velocity, there is a tendency to an outward movement of the higher-density material, displacing the lower-density material

FIG. 3.—*The cooled pipe-casting emerging from the machine, after the mould has been vibrated to loosen the refractory lining.*



Centrifugal Casting

toward the inner pipe surface. In this manner, small slag particles and other light non-metallic inclusions are separated out toward the i.-d. surface, to be removed by a subsequent machining operation.

Pouring Temperature and Rate

The temperature of the metal entering the mould, and the rate of pouring, modify the influence of mould speed on the structure and segregation. The spinning speed has to be increased as the pouring temperature is increased, in order to minimize slipping and cascading during the period of pickup of the metal poured into the mould. This is due to the increase in metal fluidity at the higher pouring temperatures. Slower pouring, however, may compensate to some extent for an increased pouring temperature, since it enables acceleration to be brought about more effectively. In other words, the minimum spinning speed for satisfactory castings will be lower when using a slow pouring rate or a low casting temperature than when using faster pouring or hotter metal.

Too low a casting temperature, along with slow pouring, gives rise to cold lapping and possible gas entrapment. It is important that the pouring rate be sufficient to keep the metal advancing over the mould surface continuously until the end of the mould is reached. If it stops even momentarily, cold shuts result.

Longitudinal Cracks

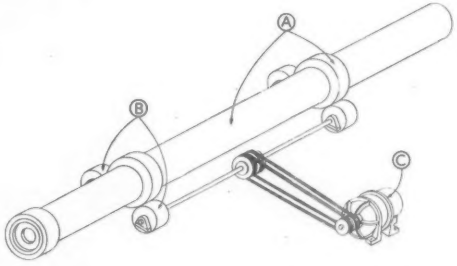
High pouring temperatures, rapid pouring, and high mould speeds are believed to be the main causes of the formation of longitudinal cracks. These defects are initiated in the early stages of solidification. One step seems to be the rupturing of the thin outer shell, undoubtedly by the circumferential tensile stress becoming sufficiently great, after the shell has contracted away from the mould, to cause rupturing of the shell. The stress in the shell is increased by increased spinning speed, and also by pouring the liquid metal into the mould rapidly, either of which act to increase the total effective centrifugal pressure. A high pouring rate or high casting temperature also decrease the rate of solidification, so that a thinner shell is formed within any given time and hence is more prone to rupture.

Heat Extraction from the Outer Surface

Since it is all-important to have early heat withdrawal, mainly outward from the o.-d. surface of the casting, so that solidification will progess inward across the casting wall, attention must be given to the mould which will take up and dissipate this heat. When the metal is first poured into the mould, heat immediately starts flowing from the hot metal surface into the wall of the cold mould. This heat exchange causes the temperature of the metal to drop and the temperature of the mould to increase. The temperature gradient across the mould wall is initially very steep. The rate and amount of heat transferred from the metal to the mould material, and the temperature gradient established across the mould wall, are determined by the thermal conductivity and specific heat of the mould material.

Mould Cooling

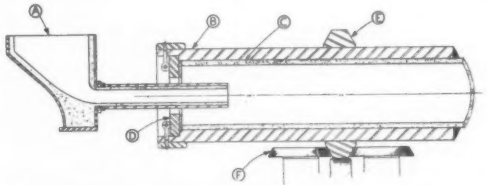
At such time as the first heat units reach the outer mould surface, which is in contact with air at room temperature, heat transmission away from the



KEY: A—metal core case with driving bands; B—drive rollers, and C—motor drive.

FIG. 4.—*Diagram showing the essential parts of a centrifugal-casting machine.*

mould commences. How hot this outer surface becomes depends on the relative rate at which heat is delivered to this surface, as contrasted to the rate it is transmitted away from the surface. The cooler this outer surface of the mould is maintained, the more steep will be the temperature gradient from its inner to outer surface, and the more rapid will be the rate of heat withdrawal from the casting. A water spray or bath is often used to cool the outer mould surface. The period of heat removal that is most important is, of course, that in which the first 100 to 150-deg. C. temperature drop occurs in the casting. This is the period during which the liquid metal solidifies.



KEY: A—refractory-lined pouring basin; B—core case; C—refractory lining; D—face-plate closure; E—core-case driving band, and F—thrust rollers.

FIG. 5.—*Sectional drawing of the pouring basin, metal mould and casting machine.*

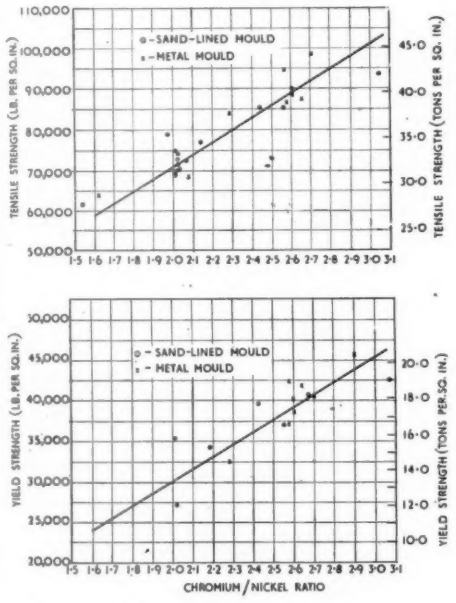
Radial Pressure during Solidification

To illustrate the magnitude of the radial pressures developed and operative to provide a sound casting, the production of a 24-in. o.-d. casting will be considered. The radially-acting pressures at various depths beneath the i.-d. surface of a 24-in. o.-d. casting, poured with an amount of metal to give a

three-inch wall thickness, are shown in Table 3. Both the radial pressures in lb. per sq. in., and the equivalent static head heights corresponding to these radial pressure values, are given. The pressure values shown are those developed at a rotational speed such as to provide a centrifugal force of 75 times gravity at the mean diameter of casting.

TABLE 3.—*Pressure Distribution across the Wall Section of a 24-in. o.d., 18-in. i.d. Casting made of Stainless-steel.*

Casting diameters.		Radial pressure (lb. per sq. in.).	Equivalent static-metal head height (ft.).
I.D. (in.).	O.D. (in.)		
18	24	62.7	18.8
18	22	39.8	11.8
18	21	29.1	8.7
18	20	18.9	5.6
18	19	9.2	2.7
18	18	0	0


o - SAND-LINED MOULD
x - METAL MOULD
TENSILE STRENGTH (LB. PER SQ. IN.)
TENSILE STRENGTH (TONS PER SQ. IN.)
YIELD STRENGTH (LB. PER SQ. IN.)
YIELD STRENGTH (TONS PER SQ. IN.)
CHROMIUM / NICKEL RATIO

In Figs. 6 and 7 the equation: $\frac{Cr-16C+2\,Si}{Ni+0.5\,Mn}$, gives the ratio of austenite-forming elements *versus* ferrite-forming elements.

FIG. 6.—(*top*) *Graph showing how the room-temperature tensile strength of centrifugally-cast CF-3 stainless-steel alloy is influenced by variations in chemical composition, and* (*below*) *similar graph for yield-strength.*

The magnitude of the radial pressure of molten metal pressing against the solidification front, which is advancing across the casting wall section from the o.-d. to the i.-d. surface, is readily visualized when expressed in terms of the equivalent static head heights shown in the right hand column of Table 3. From this, it is evident that the process of solidification and feeding of the solidification shrinkage occurs under conditions far more ideal than ever attained in static floor castings, or when forging ingots.

Machining Stock Allowances

A depth of metal from both the o.-d. and i.-d. surfaces of the tubular centrifugal castings must be removed by machine turning and boring operations, to provide a clean, sound finished product. In the case of a stainless-steel casting intended to finish with a $\frac{1}{4}$-in. wall, the amount to be machined away may be as much as 56 per cent. of the as-cast wall thickness. The amount of metal to be removed expressed as a percentage of the total cast wall-thickness decreases progressively as the wall-thickness required for the finished machined casting increases, so that, when providing a finished four-inch wall-thickness casting, only some 32 per cent. of the as-cast wall will need to be removed by machining. Table 4 shows the casting dimensions which would be required to provide sound machined castings (of 24 in. o.d.) with finished machined wall thickness varying from $\frac{1}{4}$ to four in.

TABLE 4.—*Depths of Stainless-steel to be removed by Machining to provide a Clean, Sound Tubular Product.**

Finished dimensions (in.).			As-cast dimensions† (in.).			Depth of metal to be removed by machining (in.).	
O.D.	I.D.	Wall thick-ness.	O.D.	I.D.	Wall thick-ness.	O.D.	I.D.
24	22½	¾	24 7/16	21	1 15/16	7/16	¾
24	21	1½	24 7/16	18 13/16	2½	7/16	1 7/16
24	18	3	24 7/16	15½	4 15/16	7/16	1 7/16
24	16	4	24 7/16	12½	5 15/16	7/16	1 7/16

* The rotational speed for each casting gave a centrifugal force of 75 times gravity at the mean diameter.
† For castings produced on a 1-in. thick refractory lining in a metal mould.

The stock to be removed, by machining, from the o.d. of the casting is mainly that which has been found necessary to take care of any bow that may occur along the length of the casting while handling, especially during subsequent heat-treatment. The stock to be removed by machining from the i.-d. of the casting is largely that metal which has served as the " feeder " metal (last to solidify), and as a result contains micro- and macro-porosity.

Greater Pressure

It is of interest to note from Table 5 that the equivalent static head height of the radial pressures present during the casting of the aforementioned 24-in. o.-d. tubes, at the depths beneath the i.-d. surface which will be removed by machining, are far greater than normally used in making a static casting. Thus, it is evident that the section of wall-thickness of the centrifugal casting remaining after machining away the o.-d. and i.-d. stock metal is cast and solidified under considerable radial pressure generated by the centrifugal force. For this reason, the centrifugal process ensures in a vast majority of cases the production of dense, non-porous tubular shapes.

Centrifugal Casting

TABLE 5.—*Radial Pressure in 24-in. o.d. Stainless-steel Castings at Location of Maximum Depth of I.-d. Stock to be removed by Machining.*

Finished wall-thickness (in.).	As-cast wall-thickness (in.).	I.-d. stock (in.).	Radial pressure at I.-d. stock depth.	
			Lb. per sq. in.	Equivalent static head (ft.).
¾	1 13/16	¾	15.7	4.7
1½	2 ¾	1 3/16	20.0	6.0
3	4 13/16	1 7/8	25.6	7.6
4	5 13/16	1 13/16	27.2	8.1

PROPERTIES, AND INSPECTION TESTING

Tubular centrifugal castings conform readily to the mechanical and physical test requirements of the various ASTM casting specifications, for which the test sections are specified to be taken from well-fed test-blocks. Also, the heat-treated centrifugally-cast steels of most compositions are as strong as comparable sections of the same steel, rolled or forged and similarly heat-treated.

Tensile Strength

Table 6 shows average tensile-test results for sections taken directly from some 100 consecutive tubular centrifugal-castings, in each of three alloys differing widely in composition and heat-treatment. It is evident that tensile properties are being provided which continually exceed the ASTM Specification requirements. This is attained through chemical composition control in the melting furnaces from heat to heat giving reproduceably sound metal in the fully-machined wall section of the castings.

Unique Features

One important feature of the tubular centrifugally-cast metal is the uniformity of tensile properties in the longitudinal and transverse direction. This is not the case for the wrought-steel products. Another feature which is highly important is that the tubular centrifugal-castings can be produced in alloys which are not amenable to forging or rolling. An important case in point is with stainless-steels, wherein the composition balance can be so altered for the casting within specification limits that tensile strengths ranging from 26·79 to 44·64 tons per sq. in., and yield strengths (0·2 per cent. offset) ranging from

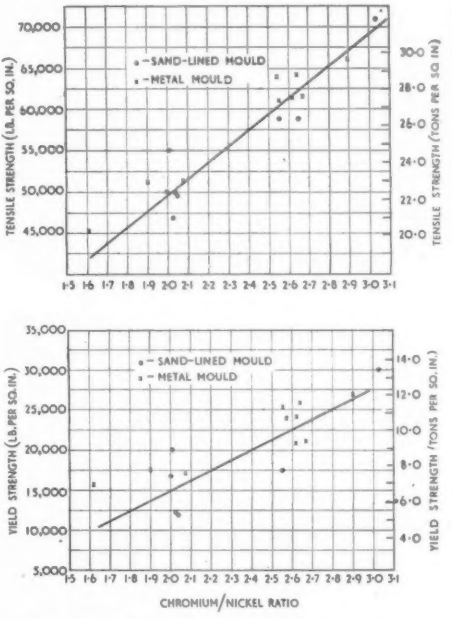

TENSILE STRENGTH (LB. PER SQ. IN.)
TENSILE STRENGTH (TONS PER SQ. IN.)
o – SAND-LINED MOULD
x – METAL MOULD
YIELD STRENGTH (LB. PER SQ. IN.)
YIELD STRENGTH (TONS PER SQ. IN.)
CHROMIUM/NICKEL RATIO

FIG. 7.—*Similar graphs to those in Fig. 6, showing how the tensile and yield-strengths of CF-3 alloy vary with chemical composition, at a temperature of 343 deg. C.*

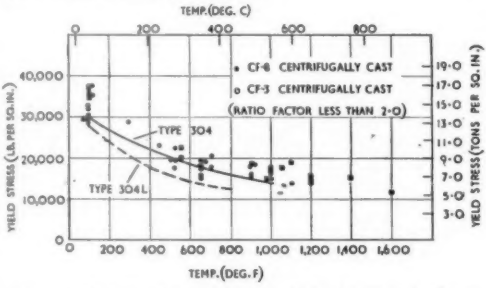
11·16 to over 20·09 tons per sq. in. can be obtained for the solution-quenched alloy. Accompanying this change in properties is a change in the percentage of the microconstituents ferrite and austenite in the metal structure. In the case of the wrought

TABLE 6.—*Melt Quality, as measured by Tensile-test Results from 100 consecutive Tubular Centrifugal-castings.*

ASTM Specification No.	Requirement and range.	Tensile strength (tons per sq. in.).	Yield strength (tons per sq. in.).	Elongation (per cent).	Reduction of area (per cent).	Brinell Hardness No.
	Alloy type—13 per cent. Cr/Fe					
A296 Grade CA-15	Specification requirement, minimum	40.18	29.02	18	30	—
	Range obtained in production*	41.96 to 47.32	31.70 to 36.16	21 to 25	45 to 55	197 to 214
	19 per cent. Cr, 9 per cent. Ni, 0.03 per cent. maximum stainless					
A296 Grade CF-3	Specification requirement, minimum	29.02	12.50	35	—	—
	Range obtained in production†	30.36 to 33.48	13.39 to 15.62	48 to 71	58 to 79	121 to 143
	Mild Steel					
A27 Grade 60 — 30	Specification requirement, minimum	26.79	13.39	24	35	—
	Range obtained in production‡	29.91 to 32.14	14.73 to 18.30	28 to 34	37 to 48	131 to 143

* Heated at 982 deg. C., air-quenched to room temperature, then tempered at 732 deg. C. and air-cooled.
† No heat-treatment.
‡ Annealed at 899 deg. C., furnace-cooled to 482 deg. C., air-cooled to room temperature.

metal, however, a duplex structure such as this interferes with the forging or rolling of the metal. Fig. 6 shows graphs of tensile and yield-strength values for tests made at room temperature, as related to ratio factor values. The ratio-factor values are simply the ratio of austenite-forming elements *vs.* ferrite-forming elements, arrived at by the formula shown in the caption. Castings are represented made both in sand-lined and refractory-coated metal moulds. There is no difference in the properties produced by the two moulds. Similar graphs of tensile-test data are shown for tests at 343 deg. C. in Fig. 7. The CF-3 alloy is shown to allow, through change in composition balance, variations in tensile strength from 20·09 to 33·48 tons per sq. in., and in yield strength from about 5·36 to 12·5 tons per sq. in.



* Presumably the stress value at which 0.2-per cent. elongation is registered—EDITOR.

FIG. 8.—*Comparison of the yield-strengths* (0.2-*per cent. off-set**) *of CF-3 and CF-8 centrifugally-cast stainless-steels, with curves showing the minimum yield-strengths required from wrought stainless-steel of the* 304 *L and* 304 *grades.*

Comparison of Strength at Temperature

A comparison, made over a wide range of temperatures, of the yield strengths at 0·2-per cent. offset of centrifugally-cast and wrought-type 304 and 304L stainless-steels is of interest, in that it shows that the centrifugally-cast metal can meet the same requirements as the wrought metal. Figure 8 presents a graph of elevated-temperature yield-strength values for cast-type "CF" stainless-steel (wrought equivalent-type 304). Onto this graph have been superimposed two curves, representing the minimum code acceptable yield-strengths of (*a*) type-304 wrought stainless-steel, and (*b*) type-304L wrought stainless-steel. These yield-strength values were derived from the maximum allowable design-stress, values given by the ASME Boiler and Pressure Vessel Code—Section VIII, Table UHA-23 and from Case 1122-6. To convert from the design-stress values set forth in the codes to yield-strength values, the former were divided by 0·625. The yield-strength values at 0·2-per cent. offset of the centrifugally-cast metal are shown by squares for the 0·08-per cent. carbon (max.) grade, and open circles for the 0·03-per cent. carbon (max.) grade. The values plotted are for heats with chemical compositions such that their ratio factors were less than 2·0. It is readily apparent from Fig. 8 that the centrifugally-cast metal displays yield-strength values in the same range as, and at least equal to, wrought metal for both the extra-low carbon and regular grades of stainless-steel in the annealed condition. It is therefore evident that ASME Boiler and Pressure Vessel Code design-stress values, Section VIII, Table UHA-23 and Case 1122-6, should apply to centrifugally-cast pipe meeting all other inspection test requirements.

* * *

In the complete paper, the above section on properties and inspection testing concludes with comments on the weldability of centrifugal castings made from CF-3 alloy (wrought equivalent 304L). The next main section of the paper consists of an evaluation of centrifugally-cast pipe for high-pressure, high-temperature service in nuclear-power plants, in which a description is given of the incorporation of a CF-3-alloy pipe into a test loop at the works of Westinghouse Electric Company. The author concludes by describing tests carried out at the Battelle Memorial Institute on the mechanical properties of a centrifugally-cast heavy-walled pipe, made by Sandusky Foundry Company from a 2¼-per cent. chromium/1-per cent. molybdenum steel. The results of tensile, creep, creep-rupture, hot- and cold-bend, extrusion and swaging tests are given.

Massey-Ferguson's UK Organization

Under the title of "United Kingdom Operations" a single management group has been established, with headquarters at Coventry, to control and co-ordinate all Massey-Ferguson operating activities in Britain. Mr. A. A. Thornbrough, president of the world-wide company, assumes, for the time being, executive direction of United Kingdom Operations as managing director.

Massey-Ferguson (Great Britain), Limited, will change its name to Massey-Ferguson (United Kingdom), Limited, and Mr. Eric Young will be deputy managing director. He is deputy chairman and managing director of Massey-Ferguson Holdings, Limited, which will continue to meet statutory and financing requirements covering all British subsidiaries. The creation of separate operations units in Australia, France, Germany, North America, and the UK accords with the new global structure of the parent company with Britain as the cornerstone of world expansion.

K. & L's New Branch Factory

Increasing demand from both home and export markets for Jones mobile cranes, has led to the acquisition by K. & L. Steelfounders and Engineers, Limited, of Letchworth, Herts, of one of the Board of Trade factories at Newburn-on-Tyne, some five miles from Newcastle-on-Tyne. The factory, which has been acquired for expansion of the company's engineering division, is situated on the Newburn Trading Estate which is administered by North East Trading Estates, Limited. It has a floor area of 24,000 sq. ft., and is complete with all power, lighting, heating and other services, and has a two-storey office block.

Due to the shortage of skilled engineering personnel in the Letchworth area, and in conformity with Government policy, this expansion has been planned to take the work to where men are available. It is expected that a start will be made in the next few weeks with a dozen or so machines, and a gradual build up will continue through 1960.

Stanton Ironworks' New Ore-preparation Plant*

A new ore-preparation plant, designed to process from 25,000 to 30,000 tons per week, was opened in October, at the Ilkeston works of the Stanton Ironworks Company, Limited. It has taken two and a half years to construct, at a cost of nearly £4,000,000. A site of 40 acres had to be prepared before the plant could be built, a stream having to be diverted. This new plant forms an essential part of what is now a fully integrated ironmaking works. The plant is of particular interest to founders because the output from the Stanton blast-furnaces consists almost wholly of pig-iron for foundry re-melting. Obviously, any steps to produce this iron more economically and with greater uniformity of composition in a versatile range will be welcomed by founders.

More than six miles of conveyor belting is in use at Stanton's new ore-preparation plant at Ilkeston, near Nottingham, and there are sidings for 700 wagons. Altogether, 180 men are employed, including electrical and mechanical maintenance staff. The whole plant is provided with an extensive range of instruments (see Fig. 1), the various sections being controlled from central points, and it has its own electrical and mechanical-maintenance shops, offices, stores and ablution centre. (Conveyors and gantries were by Moxey, Limited.)

The iron ore to be prepared is received by rail, and extensive sidings facilitate the assembly of the various ores constituting the blend. From these sidings, the wagons are fed by gravity to a wagon haul, which delivers them to a tippler rated at 30 wagons per hr. The ore passes from the tippler hopper, *via* rough screening feeders to the primary crusher (rated at 800 tons per hr.), which reduces it to 6 to 8 in. in size. The ore then joins the rough screened material and is conveyed (see Fig. 2) to the secondary crushers, where it is reduced to a maximum size of 3 in. (Main contractors for the crushing plant were Mitchell Engineering, Limited.) After crushing, the ore is conveyed to the bedding plant (supplied by Fraser & Chalmers, Limited), where it is spread horizontally in piles each containing 6,000 tons, and later reclaimed in vertical slices to ensure a uniform mixture of the various ores. The reclaimed ore then passes to the screen house, where the minus-½-in. material is screened out and conveyed to the sinter-plant stockyard. The plus-½-in. size is conveyed *via* the distribution bins to one of the two blast-furnace plants. (Head Wrightson, Limited, supplied two 2½-ton ore-transfer cars.)

FIG. 1.—*Part of the main sinter-plant control-room. The control staff are linked by telephonic communication with the plant operators.*

Sinter

The sinter material, consisting of various types of ore fines and coke fines, is assembled in blending bunkers and discharged in the correct proportions through table feeders on to a conveyor. The sinter mix is conditioned in a mixer and evenly spread on the continuously moving sinter strand (see Fig. 3). The mix is then ignited under a hood fired by blast-furnace gas, and combustion is continued as the strand moves along by means of air drawn through the bed of material by the extraction fan. Hot sinter is discharged from the end of the machine *via* a breaker and a hot screen for removing fines into a large-diameter rotary cooler. Cooled sinter is delivered by conveyor to the distribution bunkers for discharge to the blast-furnace bins. Dust-extraction equipment is installed on the sinter plant at every critical point. (Most of the sinter plant was supplied by Huntington Heberlein, Limited. The dust-extraction equipment consists of a How-

* The official opening of the plant was described on page 274 in the October 8 issue of the JOURNAL.

den Centicell unit, which operates at a rate of 45,000 cub. ft. per min. at a pressure of 7.5 in. water gauge, at 200 deg. F.)

Blast Furnaces

The ore-preparation plant serves two modern blast-furnace plants: the Old Works, which is a two-furnace plant, and the New Works, which is a three-furnace plant. These are entirely separate installations complete with ancillary plant, including pig-casting machines. In addition, however, to the common ore feed, they have a common coke supply from the battery of 85 Becker regenerative combination ovens with a weekly capacity of 8,500 tons of blast-furnace coke, and an extensive distribution system for clean blast-furnace gas. Each of the blast furnaces has a hearth dia. of between 17 and 18 ft., and the total ironmaking capacity of the two plants is between 600,000 and 700,000 tons per annum. The blast-furnace gas, after cleaning to very fine limits, is used for firing the hot-blast stoves and for generating steam which operates the turbo-blowers and turbo-generators. The remainder is used for under-firing the coke-oven battery, thus liberating 24,000,000 cub. ft. of coke-oven gas per day for distribution by the East Midlands Gas Board.

The five blast-furnaces make foundry pig-iron to a wide range of analyses, and it is for this reason that the ore-preparation plant has been made completely flexible, so that ores of varying composition can be used to achieve the desired results. All the pig-iron produced can be machine-cast, and approximately half of it is used in the company's own spun-pipe plants and foundries, leaving the remainder for sale to outside foundries.

Ore-stocking: The success of the new sinter plant depends in large measure on full integration with the company's much enlarged ore-stocking facilities, mentioned earlier. The open stockyard can accommodate 16,000 tons of foreign-ore fines and 22,500 tons of home ore. Under-cover-stocks can take 4,000 tons each of foreign and home ore, with 3,000 tons of miscellaneous materials and 500 tons of coke.

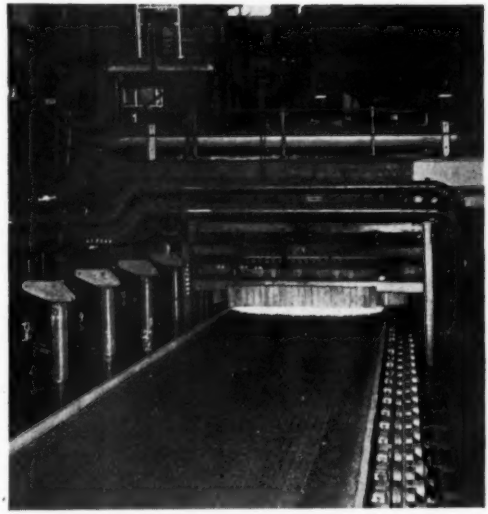
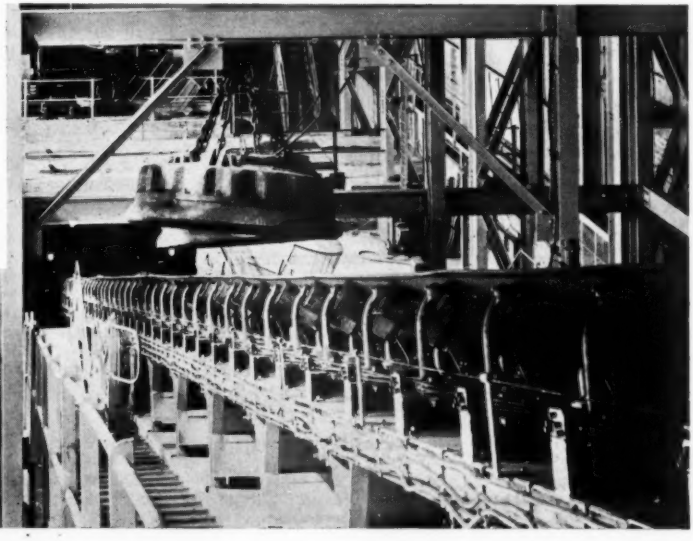


FIG. 3.—*The sinter strand at Stanton's new £4,000,000 plant, with the ignition hood and feed hopper in the background. A large number of special heat-resisting cast components are used in the construction.*

FIG. 2.—*In the new Stanton crusher-house, it is interesting to note the use of a pair of standard lifting-magnets, carried on overhead runways, for taking tramp iron from the ore as it is conveyed to the secondary crushers. Shown below is a cast roller for the Hadfield primary crusher used.*



"Permindex"—an International Market Place

"Permindex," a permanent market place for the sale of industrial products made in many countries, is to open in Rome at the beginning of 1960. Permindex is a shortening of the words "permanent industrial exhibition." It will be housed in the four large marble buildings erected for Mussolini's 1942 Universal Exhibition—a project which the war effectively killed. The buildings are truly magnificent and have a total floor space of over 420,000 sq. ft.

The idea behind the project is to provide a centre where it will be possible to buy and sell, in one market place, the best of the world's industrial products. Mr. Ferenc Nagy, president of the sponsoring organization, epitomized the proposal when he told how the representative of a large Californian store complained that, coming to Europe to buy 156 different articles, he spent 10 weeks in travelling over 14 countries. This buyer would accomplish all that he wanted at the new world trade centre, said Mr. Nagy.

Categories Embraced

The exhibition will not be confined to store goods: it is to embrace exhibits of the heavy industries, including mining machinery and mechanical engineering products, machine tools, and foundry and railway equipment. The following are the main sections:—Industrial machinery and equipment; electrical goods; chemical products and raw materials; mechanical engineering and power; building; office equipment; pharmaceutical, medical and dental products; food and drink; toys; scientific equipment; furniture; clothing and accessories; jewellery; optical goods; transport; travel, and tourism and sport.

Exhibits will be placed in categories and not on a nationality basis; they will be permanently sited, and they will be brought continually up to date. Buyers of dynamos and diesel engines, for example, will find the products of firms throughout the world grouped together for easy and rapid comparison.

It is hoped to sponsor various international business conventions in the exhibition halls. Where exhibitors do not wish to employ permanent stand-personnel, staffing of the exhibits will be undertaken by Permindex, for an inclusive fee. The exhibition halls will be open to the public, and in this connection the promoters point out that 20,000,000 tourists visited Italy in 1958. Rome is to be host to the Olympic Games in 1960, when 300,000 spectators a day are expected in the various stadiums. (Permindex's representative in Great Britain is Industrial and Trade Fairs, Limited, Drury House, Russell Street, London, W.C.2).

British Aluminium's Steady Progress

Steady progress had been made on product developments and aluminium was finding its way into many new applications, reported the chairman of the British Aluminium Company, Limited, Sir Ivan Stedeford, at the annual meeting. Orders, particularly from the home market, had improved during the seven months to July 31, 1959, and he believed this trend would continue, but it held no firm promise of an early return to conditions of full recovery which the directors confidently awaited.

Sir Ivan said that the period in review was one of consolidation rather than expansion. More satisfactory results had been produced due to a combination of improvements in the operational efficiency of the fabricating side and a higher rate of working due to an upturn in demand.

Midland Heating & Ventilation's Golden Jubilee

This year the Midland Heating & Ventilation Company, Limited, of Bedford Road, Birmingham, 11, celebrates its Golden Jubilee. The company was formed towards the end of the nineteenth century to exploit new practices in central heating and associated engineering, and at that time occupied premises at Upper Trinity Street. The staff consisted of four draughtsmen, two employees for general administration and about 20 general operatives. Since one of the early shareholders was a prominent rubber company, it is not surprising that, in the first instance, its main interest was manufacturing plant for the rubber industry for export to Malaya.

In 1909 the company was incorporated, and then in 1916 it moved to larger premises in Bedford Road, and became a pioneer in the manufacture of dust-arresting and filtration plant. Mr. C. H. Harton who was manager in 1909 remained until his retirement as managing director in 1949, when the company became associated with the Carter Thermal Industries group, with Mr. John Carter as managing director.

To-day, the heating division operates in a substantial way, being both designers and contractors for office blocks, factories, etc., whilst the plate and sheet works, now housed in modern factories, build fans, blowers, evaporative cooling towers, dust-arresting plant and associated equipment, not only for the home market, but also for exporting to many parts of the world. The company is proud of the long-service records of its staff and operatives, many of whom have over 25 years to their credit, some over 30 years and a few over 40 years. Their services were recognized at a celebration dinner last Friday.

Sheffield Firm's Expansion Scheme

Expansion scheme for Shepcote Lane Rolling Mills, Limited, Sheffield, owned jointly by Firth-Vickers Stainless Steels, Limited, and Samuel Fox & Company, Limited, has been approved by the Iron and Steel Board and the British Iron and Steel Federation. The scheme, which will cost about £2,000,000, is for the installation of new plant to meet the increasing demand for stainless steel. The expansion is primarily concerned with the extended production and increased processing facilities of stainless-steel strip in coil form.

At present the mill produces about 400 tons of coiled strip per week and it is anticipated that when the expansion programme is completed production capacity will be increased by about 50 per cent. Mr. J. T. W. Dewar, who is managing director of the company, is also managing director of Firth-Vickers Stainless Steels, and a director of the English Steel Corporation, Limited.

It is hoped to have part of the expanded production facilities available in the latter half of 1961 and the project completed by 1962. Firth-Vickers has its own warehouse and processing facilities adjoining the Shepcote Lane works and will be expanding sections of its own plant to cope with the increased production. Samuel Fox & Company has a similar plant at Stocksbridge.

Shepcote Lane Rolling Mills is one of the largest works of its kind in the world. In 1954 it began a £1,500,000 expansion programme and by the early part of 1958 had a hot mill capable of handling slabs of metal up to 8,000 lb. in weight and of rolling stainless strip up to 41½-in. wide.

British Ironmakers and Ironfounders Abroad

By M. Schofield

On the continent of Europe one often hears of British pioneers who made their mark and added to their country's reputation. At times, the distinction granted is rather insignificant or even doubtful; as when a Britisher of eminence has patronized a health resort like Menton, or as at Offenbach where the Drake statue commemorates a man supposed to have introduced the potato into Europe. But where steelmaking and ironfounding are concerned then the statues should have gone up with no uncertainty as regards the pioneers.

At Corby it needed a German plaque to commemorate Gilchrist Thomas, that London police-court clerk who dabbled with chemistry in his evenings and went on to banish the bogey of phosphorus in steel. Yet in Europe the memorials are missing, reminders only being stirred up by odd incidents.

Welsh Founder of Stalino

A first-rate example came recently when the Mayor of Stalino showed to British journalists the house where Mr. Krushchev lived when a worker there before the revolution. The house near the slag heaps, the journalists were told, was one of those built for workmen brought there by a British company headed by a Welshman John Hughes, who developed Stalino as a coal and ironmaking centre. The journalists were not told, or reminded of, why John Hughes came to this part of Russia, and where exactly he came from, or were they reminded of the fact that Stalino was once named Yuzofka, a Russian version of Hughesofka, a name which would have perpetuated this remarkable Welshman who set up "Hughes's Works" to supply all Russian railways from St. Petersburg to Samarkhand with iron (most probably *wrought* iron—EDITOR) for railways.

Before this pioneer came there was a vast plain, or steppe, with primitive peasants and *tchumaks*, or carriers, driving bullocks for transporting grain and bringing back other commodities. Then the Hughes's came, the father and then his four sons, to enable this Don country to outstrip the Urals of those days, with ironworks dotted about the vast area: with "the landscape lit up at night," as the scene was described.

Since the Dictionary of Biography finds no space for this Hughes, though commemorating other men with that name of less significance, a note on this founder of Stalino is of interest. John Hughes was born at Merthyr Tydfil, the son of a blacksmith, and received his first training in the ironworks at Cyfarthfa. After much experience at the Ebbw Vale works and at Llasnewydd, he established a "mechanical factory" at Newport. But he was soon off to London, there to become chief controller, or director, of a Millwall iron- and shipbuilding yard, to make a name for his "Millwall shield," a resistant armour-plate which was to attract the close interest of Russia.

The Czar's government needed industries for development and railways to improve transport; so there came the invitation to this Welshman who made Millwall "steel" so superior to all others. Russia had to import iron and steel from Merthyr and the Dowlais area at great cost before the idea came to bring over John Hughes to set up a Russian industry.

After an extensive tour of Russian mines and with permission to select any suitable place for establishing a full-scale iron industry, Hughes in 1869 decided to settle in the broad valley of the Donetz, a lonely place on the steppes yet not too far from the iron resources of Krivirog and from the port of Taganrog. He set up his "New Russia Company," which in a few years employed 3,000, and gave rise to a large town built for the employees. It was found essential to bring in skilled men from Britain; hence, Hughes induced a number of iron workers to emigrate from Merthyr, Dowlais, Rhymney and Middlesbrough and help in the great enterprise.

John Hughes died 70 years ago, yet his works were carried on by his four sons, with his second son Arthur becoming manager of the Hughesofka works. In 1917 the Soviet government took possession of all industrial companies, so the New Russia company was absorbed and the name of Hughesofka changed to Stalino.

Ironfounding in France

The pioneering work of John Hughes came almost a century after another example of this contribution to European iron industry from British ironfounders. This was the establishing of the great foundries of Nantes and Le Creusot by the Wilkinsons, a comparable example to that of Hughes since it was a question of armaments which brought it into being. There has been at times some confusion as to which of the Wilkinsons should be given credit; yet it is not difficult to decide that John Wilkinson was the brains behind the business, with brother William carrying out much of the supervision as manager of "the foreign business" of the Wilkinsons.

In 1774, John Wilkinson had begun his technique for boring cannon from solid castings, the casting being rotated while the boring bar was rigidly fixed—the opposite to his well-known cylinder-boring in a lathe in which the tool rotated in the normal way. In the 1770's the French were keenly interested in this method of producing cannon since their own often shattered on firing; hence the urgent request to Wilkinson to build a state ironworks, cannon foundry and boring-mill at

British Ironmakers and Ironfounders Abroad

Nantes during the period 1777 to 1780.

Before this there had been a visit by Marchant de la Houlière to the Midlands and to the Broseley works of Wilkinson, when the scheme for establishing an iron foundry in France was discussed. John Wilkinson agreed and saw in the carrying out of this foreign deal an opportunity to get rid of William who had proved such a difficult partner at Wrexham. Hence, it was William Wilkinson who actually spent much time in France from 1775 and who supervized the building of the Nantes foundry where a number of old guns dumped in French arsenals were re-melted. A coke blast-furnace was urgently wanted at this time, so that the French Minister got a Captain De Wendel to report on whether Wilkinson should continue to stay in France. Since the French government had given De Wendel a 15 years' lease on condition he got the necessary blast-furnaces built, he continued with the collaboration of William to construct plant similar to that used in Britain.

Pipe Manufacture

The Wilkinsons had by now enhanced the reputation they had in that country both for ordinance and for iron pipes and cylinders. The brothers Perrier, engineers for the Paris waterworks, gave orders to William for 40 miles of cast-iron piping. Then towards the end of the 1770's came the building of the second famous French foundry and ironworks, this at Le Creusot. Here, again, it was William who supervized the building and working of blast-furnaces there, though John Wilkinson was the leading light in the eyes of the French Minister of Marine.

An engine was successfully installed at Le Creusot (or "Creuzot" or "Creusal" according to the spelling of John), the engine when "in operation" causing "the Frenchmen to be delighted. . . . It is a complete success and the numerous visitors expressed their satisfaction. I wish you were here," wrote Wilkinson to Watt. "The French say that this Englishman (Monsieur Weelkinsong) taught them to bore cannon in order to give liberty to America" was an apt remark of Arthur Young on his travels through France.

The Creusot Royal Foundry with four blast-furnaces 39-ft. high compared with the 26-ft. height of charcoal furnaces was the foundation of modern iron smelting in France, the furnaces being first tapped in December, 1785.

So much has been written on the contributions made by craftsmen from Europe in Britain's non-ferrous metal industries that it is appropriate to emphasize the other side to the picture when iron-making and founding is concerned.

COOKE, TROUGHTON & SIMMS, LIMITED—Mr. A. H. Hird has found it necessary to resign from the board and from his office as chairman owing to the extent of his other duties within the Vickers group. Mr. R. P. H. Yapp, a director of Vickers, Limited, has been appointed a director and chairman of the company in succession to Mr. Hird.

ISI Translations

From amongst the most recently published lists of translations available from the Iron & Steel Institute (4, Grosvenor Gardens, London, S.W.1), the following have been selected as being of interest to founders. The price quoted is that for single copies, postage extra, there being reductions for quantities ordered. Readers writing for translations, or for further information, should mention this JOURNAL when doing so.

1433 DEVELOPMENT OF ARC STEELMAKING FURNACES AND OF ELECTRODE-CONTROL MECHANISM. Driller, A. *Elektrotechn. Z.*, 1956, Feb. 21, pp. 41-47. (£4 5s.) The growing demand for electric-furnace steel is leading to the construction of new arc furnaces with a capacity of up to 120 tons and ratings up to 36,000 kva. New automatic electrode-control mechanisms have been developed, namely hydraulic, *e.g.* with plunger-control mechanisms, and electromechanical with amplidyne generators magnetic amplifiers.

Translations in course of preparation include:—

1496 VELOCITY OF SOUND AS CHARACTERISTIC VALUE OF THE QUALITY OF CAST-IRON. (From German), Ziegler, R., and R. Gerstner. 24th International Foundry Congress, 1957, Aug. (6), pp. 133-157.

1502 SELECTION OF BLOWERS FOR CUPOLAS. Anon. *J. d'Inf. Tech. Ind. Fonderie*, 1959, Jan., pp. 1-3.

The initials CEGB, etc., stand for the organization to which enquiries for the translations should be made, quoting the reference numbers.

CEGB: B.E.T. 136 ANDRITZKY, M. "New Developments with Mechanical Dust Extractors Abroad." *B.W.K.*, 1950, May, vol. 2, p. 136.

CEGB: B.E.T. 320 ANDRITZKY, M. "Flue-gas Dust Separation." *I.V.A.*, 1949, vol. 20, pp. 275-89.

CEGB: B.E.T. 235 FEIFEL, E. "The Standard Cyclone: a Measuring Instrument for Dust-separation Technique." *A.T.M.*, 1950, Oct., vol. 286, pp. 109-112.

CEGB: C.E.T. 236 GUTHMANN, K. "Dust Removal." *Stahl u. Eisen*, 1950, May 11th, vol. 70, pp. 420-22.

ID-U. Exch. 117 GRUZIN, V. G. "Thermocouple for the Measurement of Steel Bath Temperature." *Zavods. Lab.*, 1948, No. 11, pp. 1396-7. Trans. in *Eng. Dig.*, 1949, Oct. 10.

ID-U. Exch. 119 IVANOV, M. V. "*Einfluss der chemischen Zusammensetzung und der Abkühlungsgeschwindigkeit auf die Verschleissfestigkeit von Grauguss.*" *Liteinoe Proizv.*, 1959 (4), pp. 35-37.

ID-U. Exch. 133 MUSIL, J. "*Kolbenring aus Kugelgraphit-Gusseisen.*" *Zprevoday*, 1957 (3-4), pp. 22-28.

CDS. I.T. 2590 OKAMOTO, M., and S. OKADA. "*Etude de l'acier inoxydable* 17-4-4 (Cu). I. *Influence des teneurs en cuivre, carbons et azote sur les propriétés des moulages.*" (en japonais) *Nippon Kinzoku Gakkai-shi*, 1959, July, 22, No. 7, pp. 363-67.

CDS. I.T. 2591 PISHCHEV, V. M. "*Technologie de la fabrication des coquilles pour la coulée centrifuge des tubes.*" (en russe.) *Liteinoe Proizv.*, 1956, No. 4, pp. 10-12.

CDS. I.T. 2599 SAWADA, K., and T. OKA. "*Etude des lingotières en fonte nodulaire.*" (en japonais.) *Suiyōkwai-shi*, 1958, Sept. 13, No. 7, pp. 513-16.

CDS. I.T. 2525 SHAPIRO, M. M. "*Méthode électrolytique de séparation et d'analyse des carbures dans l'acier inoxydable.*" (en russe) *Zavods Lab.*, 1957, No. 11, 23, pp. 1292-94.

DSIR Sci. Mus. Lib. 52/1634 SHRAIBER, D. S. "Ultrasonic Fault Detection in Metals." *Zavods Lab.*, 1939, vol. 8, No. 7, pp. 816-25.

ID-U. Exch. 152 STUPISHINA, O. V. "*Entkohlte Schicht in Gussstücken, die nach Ausschmelzmodellen hergestellt wurden.*" *Liteinoe Proizv.*, 1959, 5, pp. 36-38.

ID-U. Exch. 153 SUVOROV, A. M. "*Giessen von Silizium-Formguss.*" *Liteinoe Proizv.*, 1959, 3, pp. 14-16.

Symbols for sources of translations:—

CEGB: Central Electricity Generating Board, Friars House, 157-168, Blackfriars Road, London, S.E.1. ID-U: Institut fur Dokumentation—Ubersetzungsnachweis, East Berlin, W.8. Unter den Linden, 8, Germany. CDS: *Centre de Documentation Siderurgique*, 6, Rue de Lota, Paris 16, France. DSIR: Department of Scientific and Industrial Research, 20, Chester Terrace, London, N.W.1. Where the title is quoted in a foreign language the original article has been translated into that language.

Equipment & Supplies

Cold-curing Silicone Rubber

Midland Silicones, Limited, 68, Knightsbridge, London, S.W.1, have promoted cold-curing silicone rubbers from an experimental to a bulk-production basis. With these, the addition of a small quantity of catalyst converts them at room temperature into heat-stable rubbery products, no special equipment or skill being needed. The rubbers are made in three grades: Silastomer 9159, of the consistency of builder's putty, which can be moulded, milled or calendered; No. 9160, which can be spread or applied by caulking gun; No. 9161, a liquid form suitable for dipping, injection or impregnating. Applications include caulking, sealing, filleting and making flexible moulds from which resins and other materials may be cast. The material can be used at temperatures as high as 250 deg. C., and as low as −50 deg. C., and it is said to possess excellent dielectric properties and give protection against moisture, dust, oxidation and mechanical shock.

Belt Grinder

Addison Tool Company, Limited, 28, Marshalsea Road, London, S.E.1, are now marketing a Swiss-made abrasive belt grinding machine (Fig. 1) called the Diamant 225. It is totally enclosed, and is driven by a 2½-h.p. motor running at 2,800 r.p.m. A special drawer for receiving swarf is incorporated, and all parts are readily accessible for maintenance. Working height for the unit is 36 in., the maximum belt width being 3 in. and the belt length 7 ft. 4 in. One important feature is that, on opening the side cover, the tension of the belt is automatically slackened for quick changing.

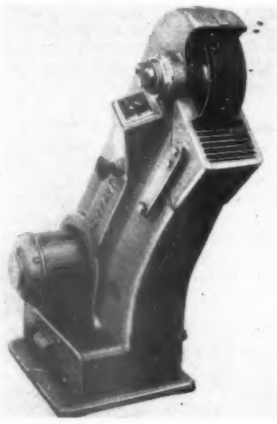


FIG. 1. — *Belt grinder marketed by Addison Tool Company, Limited, of London.*

Wood-cutting Tools

The range of tools with the Surform open-toothed blade has been extended by the addition of a 2-in. dia. drum cutter, which was demonstrated to the Press recently by Simmonds Aerocessories, Limited, in the firm's showrooms at Stornoway House, Cleveland Row, St. James's, London, S.W.1. In its simplest form, this cutter—which carries teeth on the end as well as the outside periphery—can be used for various wood tooling and forming operations, while simply mounted in an ordinary portable hand-drill. Then, when the assembly is fixed in a drill or lathe stand, or with further minor attachments, a variety of precision woodworking jobs can be accomplished, such as rebating, planing, grooving, surfacing, and routing. It is claimed that the cutter is equally serviceable for use with plastics, thus increasing its versatility in the hands of patternmakers. Except that this particular tool is not suitable for metal cutting, the design of the cutting teeth is similar to the Surform files and planes previously referred to in these columns. In the same context, it is germane to report that the same firm have now developed a hand file with a half-round blade, and also a Surcut 5-in. dia. disc-cutter for power applications.

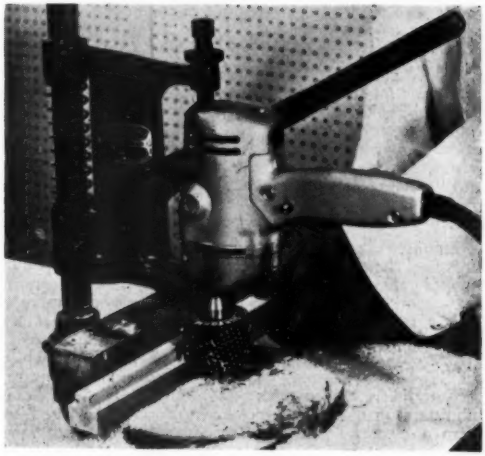


FIG. 2.—*New 2-in. dia. drum-cutter in the Surform range, shown being used for rebating when driven by a powered portable drill.*

Grinder/Sander

Atlas Copco (Great Britain), Limited, Maylands Avenue, Hemel Hempstead, Herts, have introduced an air-operated portable grinder, type LSS 62—an improved version of model LSS 61, which it supersedes. Improvements claimed include a new and patented tubular throttle to avoid power-consuming air restrictions and eliminate leakage, a hardwood handle shaped for comfort, and which maintains a comfortable temperature for the hand. A hardened front-end to the driving spindle is intended to prevent damage to the hexagon socket by the key used for tightening the wheel or brush-retaining nut. Another important feature mentioned is the special hardening and finishing of the cylinder, designed to give longer life. The machine is available with four different speeds for use on the following applications: Sanding (9-in. disc) and wire brushing at 4,500 rpm; sanding (7-in. disc) at 6,000 rpm; grinding (cup wheels) at 7,200 rpm, and with reinforced wheels for cutting-off and general grinding at 8,000 rpm.

Welding Helmets: Safety Products, Limited, Holmethorpe Avenue, Redhill, Surrey, have added Superweld welding helmets and handshields to their range of industrial safety equipment. The helmet shells are moulded in one piece from high-quality vulcanized fibre, and are tough but light. A ratchet stop gives positive alignment of the helmet in the overhead, normal and down welding positions.

Notes from the Branches

South Africa

Approximately 50 members and guests of the South African branch of the Institute of British Foundrymen visited, in October, the Isando Works of Norton Abrasives S.A. (Pty.), Limited. The party was welcomed by Mr. S. M. Gray, the company's sales manager, and then split up into small groups to visit the six main stations in the plant.

Mixing and Pressing Department

The first department to be visited was the mixing and pressing department. Here the abrasive grain and bonding ingredients are accurately weighed out according to formula, and thoroughly mixed in power mixers. The mixtures are then delivered in bulk to the pressing stations, where the precise quantity for each wheel is measured out and filled into the steel moulds while they are being rotated. After levelling off the mixture, the mould is closed with a top plate and fed into a moulding press where the mixture is compressed to form a "green" wheel. The forming pressures vary with the density of the product and are generally around ½- to 5-ton per sq. in. After pressing, the wheels are ejected from the moulds and set on batts for curing (organic) and drying (vitrified). The resinoid wheels are cured in electrical ovens at temperatures ranging from 140 to 220 deg. C., and time cycles of a few hours to several days. The oven cycle is determined by programme controllers and the temperatures held to within narrow limits. Some of the wheels when dried have to be shaped on special shaving machines. When this is completed, the "green" wheels are ready for burning or firing in the kilns where the products are set on heat-resistant Crystolon refractory batts. During the firing process the bond is fused, thereby acting on the abrasive particles to form a rigid grinding wheel. The wheels then go to the finishing department where the surfaces are trimmed by various methods to the finished shape and dimensions. The large holes are reamed to plug gauges, whilst the smaller ones are lead bushed.

Testing and Inspection

Every wheel manufactured by the company which is of 6-in. dia. or larger, is tested in a speed-testing machine at approximately one and a half times the operating speed; they are also tested for balance and counter-balance when necessary. The wheel specification, works order number and maximum operating speed are stencilled on the wheel. Finally the products are carefully inspected for size, physical imperfections, defects, etc. There is also a small laboratory testing division for checking the grade and quality of products by general methods, including the modulus of elasticity and weight per unit volume of the wheels. The storage and packing department is well equipped to deal with the 12,000 items manufactured in the factory and approximately 6,000 items are currently in stock.

The visitors were also shown the demonstration room and test room, in which is installed a cut-off machine, back stand, belt sander and tumbling department. Another division in the factory is known as the Behr-Manning Conversion Department, and this section deals with coated abrasive belts, cones, discs, etc., which are cut and processed from imported 50-yd. rolls to suit the local requirements.

At the conclusion of the visit, a cocktail party was given by the hosts and Mr. W. L. Campbell-Pitt, managing director of the company, gave a few details about the organization of the company. Mr. K. H. Coombs, branch president, thanked Mr. Campbell-Pitt and his staff for their hospitality and provision of such an informative works visit. He commented on the high standard of production and inspection and complimented the company, particularly, on the cleanliness of the plant and the obvious measures that were taken to protect the health of the staff. The vote of thanks was warmly applauded.

Natal Section

The second works visit of the newly-formed Natal section was to the Pietermaritzburg works of the Aluminium Company of South Africa (Pty.), Limited.

The works cover approximately 22 acres of which 3¼ acres are under roof, and the company employs a staff of 246 Europeans and 546 Africans. The principal outlets for products are building and construction, packaging and containers, household and commercial appliances, industrial machinery and equipment, etc.

Raw Materials

The principal raw materials used are aluminium ingot, obtained from Canada and Norway, and paper imported from Finland. On an average, 1,116 tons of ingot and 312 tons of paper are kept in stock. The ingots are supplied with an analysis certificate and, from time to time, check analyses are taken at the works on arrival. The paper is also sampled before despatch from the paper mill in Finland and, on receipt in Pietermaritzburg, is checked for substance, tearing length and burst strength, depending on the type and end use of the paper.

Melting

The three types of melting units employed are: (*a*) an oil-fired, double-hearth furnace with a capacity of 50,000 lb. and an average melting time of 10,000 lb. per hr. (*b*) Reverberatory coke-fired furnace, having a 23,000 lb. capacity and melting rate of 2,500 lb. per hr., and (*c*) a low-frequency electric-induction furnace with a capacity of 3,100 lb. and melting rate of 700 lb. per hr. The average casting temperature of the metal is 700 deg. C. This is checked by iron-constantan-type sheathed, immersion thermocouples used on all molten metal furnaces.

Metals

In all cases, aluminium is 94 to 99 per cent. of the alloy with additions of manganese or magnesium, or magnesium plus silicon, or silicon or copper or zinc. Aluminium itself is cast in purities from 99.7 to 99.3 per cent. The metal is cast into extrusion ingots, 8-in. dia. by up to 29½ in. long, or ingots for rolling, 6 by 15 by 30 in., approximately, in rectangular form. Both extrusion and rolling ingots are cast in "permanent" tilting moulds.

Heat-treatment

Aluminium pure or alloyed is the only metal heat-treated, in one or other of nine furnaces depending on the nature of the treatment. There are six batch-type annealing or ageing furnaces, two pit-type annealing furnaces and a continuous-type tunnel preheating furnace. The batch furnaces are rated at 144-200 kw. and contain loads up to 4½ tons; the rating of the pit furnaces is 140 kw. and they may contain loads up to 1¾ tons; the continuous furnace can take a maximum load of 9 tons and has a 470 kw. rating.

Heat-treatment cycles consist mainly of annealing temperatures of 400 to 500 deg. C. for four to six hours. Ageing and partial annealing require temperatures of 175 to 240 deg. C. for three to nine hours, and preheating or pre-soaking requires temperatures of 500 to 575 deg. C. for eight to 14 hours. Temperature control

is by iron/constantan thermocouples, both in the furnace atmosphere and in the load itself. Recording/controlling is maintained on each furnace with a potentiometric instrument.

London

There was a "bumper" attendance at the meeting of the London branch, held at the Constitutional Club, Northumberland Avenue, London, W.C.2, on Wednesday, November 18—about 150 members and visitors, being present, some from quite far afield. The lecturer for the evening was Mr. H. G. C. King (of British Railways—now attached to Eastleigh Works), who talked about "Patternmaking in Plastics." The use of epoxy resin for the manufacture of foundry patterns has been developed during the last four years in the British Railways locomotive works' patternshop at Crewe, and Mr. King's lecture was based on the experience and results obtained. It covered materials and equipment required, production of master patterns and moulds, and the various methods of pattern manufacture from the solid casting of small patterns to the building of large patterns by a system of lamination.

The first speaker in the discussion voiced appreciation of the Author's work and of British Railways taking the lead in this making of patterns in plastics. Another speaker, asking a question on behalf of independent founders, asked how much more plastics patterns cost than the usual wooden ones used, and Mr. King quoted the relative costs. Why was varnish put on the plaster patterns? another member of the audience asked. Mr. King said that painted patterns looked much better, and the increase in cost was small; more recently, pigmented resins had been used. A member who had had difficulty with producing resin patterns asked if the original pine-wood master needed to be exceptionally well finished and was a special taper required. Mr. King stressed his own version of the foundrymen's adage that "a plaster mould can only be as good as the pattern it is produced from" and said taper was important—it had to be positive but need not be greater than usual. With a creamed wax applied to a pattern surface and with wooden wedges driven between the frame and the plate, it should not be difficult to separate the pattern and plaster, he thought. If only 75 to 80 per cent. of filler was used in the resin, viscosity was low and air bubbles would come to the surface; machining of cured patterns, including the glass fibre embedded in them, presented no difficulty, he said. Another member thought that a file-finished cast-iron pattern could be produced more economically than a plastics pattern. Mr. King did not disagree, but said it was necessary to compare like with like; in other words, an iron plate made in that way could not be judged on the same plane as a high-quality plastics pattern. Another question concerned provision for rapping when loose-pattern moulding. Here again, the Author said he could see little point in using resin patterns for floor-moulding operations, but in response to another questioner, said that plastics patterns behaved well and were quite wear-resistant when moulds were made by impeller-type machines. Here, marble flour as a filler gave a good life and slate powder even better. The final comments by the Author included notes on safety precautions for reducing the risk of dermatitis and the need to ensure proper curing of the resins (here, a temperature of 160-180 deg. F., for six hours being stipulated.) At the conclusion of the proceedings, Mr. J. R. Booth proposed and Mr. J. P. Webster seconded a vote of thanks, which was heartily endorsed by the meeting.

Coventry Section

The dinner/dance of the Coventry section on Friday, November 27, at the Leofric Hotel, Coventry, attracted an attendance of about 200 members, guests, and their ladies, including a large number from the parent branch. It was a very well-organized and colourful affair. In addition to other prominent personages and guests, at the high table, the section president, Mr. T. Player, and his lady were accompanied by the national president, Mr. C. H. Wilson, and Mrs. Wilson. It was very fitting that Mr. E. Player, C.B.E. (deputy chairman and managing director, Birmid Industries, Limited) the president's father, was called upon at speech time to propose the toast of "The Institute and the Section." Mr. Player from his long experience quoted examples of the way the Institute took very seriously its mission of expanding knowledge of the foundry industry and its dissemination to members. The response was made by Mr. Player, jnr., who referred also to a telegram of apology for absence received from Mr. Tom Weaver. "The Guests" were toasted by Mr. D. F. Bailey, who named amongst those he welcomed, not only Mr. Player senr., but also the national president and national vice-presidents of the Institute (Mr. C. H. Wilson and Mr. G. R. Shotton) with Mr. A. R. Parkes of the FOUNDRY TRADE JOURNAL and their ladies. In this case, the response was made by Mr. Wilson. To conclude the speeches, the section president expressed the thanks of

Group photograph taken at the Coventry section, IBF dinner. From left to right: Mr. G. R. Shotton, Mrs. Shotton, Mrs. T. Player, Mr. C. H. Wilson, Mrs. Wilson, Mr. T. Player, Mrs. E. Player and Mr. E. Player.

Notes from the Branches

the gathering to the sub-committee, headed by Mr. Bernard Pearson, who had organized the function. Dancing until 2 a.m. under the able direction of joint masters of ceremony, Mr. D. F. Bailey and Mr. D. R. Fardoe, continued this most successful function.

Australia (Victoria)

The Australia (Victoria) branch held its October meeting at the Metallurgy Theatre, Royal Melbourne Technical College, when members heard a paper from Mr. D. G. Evans, Mr. R. S. Higgins and Mr. G. L. Kennedy, on the subject of "Brown Coal Char as a Fuel for Foundry Cupolas." This lecture constituted the official exchange paper to the IBF Scarborough conference this year.

Allied Ironfounders' Expansion

One of the country's largest producers of heavy domestic equipment with interests up to now principally in ironfounding, Allied Ironfounders, Limited, is to expand its steel interests. The company is to take over with immediate effect the UK manufacture of a flail forage harvester of US design and, as part of its plans to move further into the agricultural machinery field, it is to set up a steel-fabricating plant within the next 12 months.

Manufacture of the forage harvester will be through Lundell (Great Britain), Limited, in which Allied Ironfounders has now acquired a 75 per cent. interest. Lundell, a small British private company at Lingfield (Surrey), has been making the flail forage harvester in this country for three years under franchise to an American company.

Plans for the group's steel-fabricating plant are not yet complete and the company is unable to give an indication of its size or cost. There will be employment, however, for several hundred people and the output will at first be mainly for the group's new range of agricultural machinery.

Long-service Presentations at Weir's

Each of 102 employees with 40 years or more service with G. & J. Weir, engineers, Glasgow, was presented with an inscribed gold watch by the chairman, the Viscount Weir, C.B.E., at a meeting at the Cathcart Works of the company on December 7. The employees came from all sections of the company, and amongst the 15 women and 87 men were the managing director and the works director; with the exception of five, all are still working with the company. The annual presentation of long-service awards is an old-established custom at Weir's, and formerly employees had to complete 50 years, in August last, however, the qualifying period was reduced to 40 years. It is interesting to note that for works personnel the average length of service is 44 years, and for office staff, 42.6 years; the aggregate score of the 102 employees is 4,416 years!

Export Opportunities

Details of equipment and machinery required by "Dökümäy Dokum Pres Emay, Limited, Sti., Sirkeci Palas 7-8, Sirkeci, Istanbul, Turkey, for their foundry and enamelling works at which baths, wash-basins, etc., are to be made, are obtainable from the Export Services Branch of the Board of Trade, Lacon House, Theobalds Road, London, W.C.1. Reference No. ESB/28034/59.

Hot-blast Cupolas

*"Best Practicable Means" for dealing with Fume, Grit and Dust**

The Chief Alkali Inspector for England and Wales has discussed with the Clean Air Panel of the Joint Iron Council (representing the ironfounding industry) measures for treating the emission of fume, grit and dust from hot-blast cupolas. It was agreed that the following could be considered as the provisional "best practicable means" within the meaning of the Alkali Act:—

(1) The discharge of fume is to be dealt with by dispersion through chimneys of normal minimum height of 120 ft. For cupolas melting at a rate of 7 tons per hour or less, consideration will be given to the use of chimney heights down to a minimum of 80 ft., depending upon site conditions.

(2) For externally-fired hot-blast cupolas above 7 tons per hour capacity and cupolas of all sizes using recuperative hot-blast systems:

During the main operating period, approximately 90 per cent. of the effluent gas shall be extracted, passed through a powered cyclone and discharged into a chimney of suitable height. The remainder of the gas during this period shall pass through a suitable arrester at the top of the cupola stack.

During the blow-down period as much of the furnace gas as practicable shall be passed through the cyclone/chimney system. In cases where it is not practicable to pass any part of the gas through the cyclone/chimney system, then it shall be permissible for the whole of the gas to be discharged through an arrester installed at the top of the cupola stack. During this period dry- or wet-arresters are acceptable alternatives.

(3) For externally-fired hot-blast cupolas up to 7 tons per hour:

The provision of a dust-leg (*i.e.*, an expansion chamber operated by the stack draught only) and a chimney of a minimum height of 80 ft. taking 100 per cent. of the cupola gases during the blow-down period as well as the main operating period. Where installations approach the 7 tons per hour figure and especially those in populous areas the Chief Inspector may ask for more efficient means of dust arrestment.

Companies contemplating the installation of hot-blast for cupola operation are advised to get in touch with their district Alkali Inspector, a list of these being recorded below.

District Alkali Inspectors.

	Telephone number
Mr. J. Beighton, 3 Warwick Avenue, Bromsgrove, Worcestershire	Bromsgrove 3022
Mr. H. Brigg, 2 Ashwood Avenue, Sale, Manchester	Sale 9800
Mr. J. E. Colehan, 13 Edward Road South, Walton St. Mary, Clevedon, Somerset	Clevedon 2891
Dr. E. T. J. Fuge, West House, South Terrace, Gainford, near Darlington	Gainford 281
Dr. W. E. Grant, 184 Gilbert Road, Cambridge	Cambridge 54613
Mr. H. Heron, 16 Watlands Avenue, Wolstanton, Newcastle, Staffs	Newcastle, Staffs 51743
Dr. L. E. Hockin, 58 Sutherland Avenue, Petts Wood, Kent	Orpington 22188
Mr. L. W. Mullinger, 21 Hillcrest Road, Great Crosby, Liverpool, 23	Great Crosby 2439
Mr. R. L. Pawson, 24 Twentywell Road, Dore, Sheffield	Sheffield 72013
Mr. J. C. Peabody, Llandough House, Llandough, Cardiff	Penarth 59481
Mr. J. Swaine, Wharfedale House, 271 High Street, Boston Spa, Yorks	
Mr. G. Tiplady, O.B.E., 36 Spring Street, Hyde Park, London, W.2	AMBassador 9925

* Communication received from the Council of Ironfoundry Associations representing an official statement of the present position. It is understood that in normal circumstances chimney height is measured from ground level and that externally-fired hot-blast cupolas are cupolas for which the blast is independently heated.—Editor.

Law Cases

Important Rating Decision

Decision of importance to scientific and technical associations which have been granted rating exemption under the Scientific Societies Act, 1843, has been made by the Court of Appeal, which has ruled that the Institution of Mechanical Engineers was not formed for purposes of science exclusively and is therefore not entitled to rating exemption for its premises in Birdcage Walk, London, S.W.1.

The court allowed an appeal by the Inland Revenue and Westminster City Council from a decision of the Lands Tribunal holding that the Institution was entitled to rating exemption. The assessment on the Institution's premises was £6,000 gross, £4,977 rateable.

Lord Justice Hodson (who sat with Lord Justice Ormerod and Mr. Justice Wynn-Parry) giving the judgment of the court, said each case had to be considered according to the terms of its charter. The Institution was constituted to "promote the development of mechanical engineering." In the court's opinion those words had a wider meaning than to "promote the development of mechanical science," and therefore the Institution was not formed for purposes of science exclusively.

The court also held that the Institution failed to comply with another condition of the 1843 Act in that it was not supported wholly or in part by annual voluntary contributions. Lord Hodson said it was impossible to ignore the fact that many of the Institution's activities were an inducement to potential members to join. They included educational work, an appointments bureau, and a model contract for use in engineering projects.

Leave to appeal to the House of Lords was granted.

Appeal Succeeds

The Court of Appeal has allowed with costs an appeal by Joseph Lucas, Limited, Birmingham, from a judgment given by Mr. Justice Wrangham at Birmingham Assize, ordering the firm to pay £448 damages and costs to Mr. Ivor Leonard Turvey, a toolsetter employed by the company, for an injury incurred at work in August, 1954.

Lord Justice Hodson said that ribbons of steel used to jam in a press from time to time. Turvey's case was that in attempting to free the press he had to use such force that he sustained a hernia. His Lordship said that the trial judge at first thought there had been no negligence by the firm, but changed his mind after hearing evidence from an expert witness. Lord Justice Hodson said, however, that in his view the trial judge was right in his first conclusion and there was nothing in the expert's evidence to cause him to alter it. The trial judge, he said, had given the wrong significance to that evidence and clearly there had been no reason to foresee an injury to Turvey. Lord Justice Ormerod and Mr. Justice N. Gorman agreed.

£1,250 for Loss of Toe

A Glasgow labourer, Mr. Daniel Fagan, whose toe had to be amputated after a 7-ft. long moulding case fell on his right foot, was awarded £1,250 damages by a jury sitting with Lord Guest in the Court of Session in Edinburgh on December 4.

Mr. Fagan, who had sued his employers, Walter MacFarlane & Company, Limited, Saracen Foundry, Possilpark, Glasgow, for £2,000, said he was moving moulding boxes from a conveyor belt at the foundry on August 18, 1956, when a box fell on his foot. He claimed that the accident was caused by the fault and negligence of his employers in failing to provide a safe system of working. The firm denied liability and maintained that the accident was caused or contributed to by Fagan's own fault and negligence.

Overalls caught in Machine

Damages of £3,800 and costs were awarded by Mr. Justice Wrangham at Sheffield Assizes to Mr. Henry Foster (51), a turner, who was dragged into a machine when a piece of equipment caught the collar of his overalls. The judge found no evidence of contributory negligence on the part of the plaintiff.

Mr. Foster, who claimed against his employers, Hadfields, Limited, steelmakers, of Sheffield, said the accident would not have happened had the lathe not been in such a "decrepit" condition. Shop foreman, Mr. Cyril Antcliffe, said Mr. Foster was wrong to try to free a loose plate. He should have stopped the machine.

Lack of Instruction

Giving judgment in an action at Wolverhampton County Court, Judge E. G. H. Beresford said that Brockhouse Castings, Limited, Wednesfield (Staffs), had failed to give Mr. John William Thompson (25), a former employee, instruction on how to face an unusual problem. Mr. Thompson was awarded £169 damages, including £69 for loss of wages.

The plaintiff had to empty boxes brought by overhead crane on to his moulding machine. On the day in question the crane could not reach his machine properly; the moulding box fell and broke three of his toes.

AT AN INQUEST at Rowley Regis on December 4, the jury returned a verdict of "Accidental Death" on Pretam Singh (32) who fell through a waste-sand hopper and was buried under several tons of sand and rubble at the works of the Repton Foundry (Tipton), Limited, The fatality occurred on December 1. Mr. Leonard Thomas Parry, who had called at the foundry to collect waste sand, told the court that when the hopper stopped running he went to the intake end and saw Singh standing on a pile of rubble over the open side of the hopper. He beckoned him to come off. While still standing on the pile of rubble, Singh began poking the pile with a bar.

Mr. Joseph Skeldon said that he had seen Singh standing on the rubble pile more than once and had warned him of the danger. Mr. Joseph Goodridge, assistant managing director of the Repton Foundry, Limited, said that since the accident, a fence had been put up to separate the grid from the open part of the hopper. He had never had any adverse comment from the factory inspector about the hopper, he added. At the speed the sand went through, he could not visualize anyone standing on the top. He was not aware that workmen did this when the hopper became jammed. It would be a highly dangerous practice, he said.

THOS. W. WARD, LIMITED, Sheffield, are to begin the dismantling of the world-famous Swansea to Oystermouth railway early in January, 1960. The line, claimed to be the world's oldest passenger-carrying railway and recently known as the "rock 'n roll" line, is closing down after 153 years. During its history it has had seven forms of motive power—horse, air, steam-locomotive, battery railcar, petrol-locomotive, diesel locomotive and overhead-electric traction. The railway once carried 1,800 people in a single train, but buses have now taken the trade. The owners estimated it would have cost £350,000 to put it on a sound footing.

Company News

CHAMBERLIN & HILL, LIMITED, grey-iron founders, of Walsall—The interim for the year to March 31, 1960, has been raised to 6½ (5) per cent. The company's two foundries are working to capacity and the prospects for the remainder of the financial year appear to be good.

J. BROCKHOUSE & COMPANY, LIMITED, iron- and steel-founders, dropforgers, etc., of West Bromwich—The South African subsidiary company, J. Brockhouse (South Africa), Limited has advised shareholders to accept the offer by the parent company of 5s. 6d. for the 5s. ordinary. The offer closes on December 15.

GLACIER METAL COMPANY, LIMITED—After a full reappraisal of the situation, the board has decided that the financial requirements of the company can best be met for the early future by means of bank borrowing. The company has arranged with its bankers for overdraft facilities up to the limit of permitted borrowing.

GENERAL ELECTRIC COMPANY, LIMITED—The British General Electric Company of Japan has been formed in connection with the company's nuclear power-station project in Japan. Although a letter of intent for the construction of a nuclear power-station was signed early this year, the company is still waiting for the Japanese to sign a contract.

METROPOLITAN-CAMMELL CARRIAGE & WAGON COMPANY, LIMITED—An interest has been acquired in Union Carriage & Wagon, Transvaal, a subsidiary of Commonwealth Engineering, Australia. The two companies have joined forces to execute a large coach order received by Union Carriage & Wagon from the South African Railways.

HILLS (WEST BROMWICH), LIMITED, manufacturers and engineers to the building trades—Preference dividend has been paid for the year ended July 31, 1959, but there is no dividend on the ordinary, as previously. There was a group loss of £28,621 (£28,352 after crediting tax relief of £11,737) and there was no tax (profits tax of £2,058 previously).

LAPORTE INDUSTRIES, LIMITED—The company is to spend £3,500,000 on additions to the capacity of its subsidiary, Laporte Titanium, Limited, at its Stallingborough (Lincs) titanium oxide plant. The expansion, which is expected to be financed out of group resources, will raise capacity from 30,000 tons to 50,000 tons a year over a period of three years.

GAS PURIFICATION & CHEMICAL COMPANY, LIMITED—Unaudited net profit, before tax, for the first four months of the current year was £305,000. Announcing this, the chairman, Vice-Admiral Sir Charles H. Hallett, said that profits were even higher in the following four weeks, the carry-over deficit on the balance-sheet had been entirely wiped out, and a loan of £100,000 had been repaid. It was intended to declare an interim dividend in January in respect of the current year.

INDIAN IRON & STEEL COMPANY, LIMITED—The chairman, Sir Biren Mookerjee, deplores low productivity enforced by compulsory retention in employment of superfluous labour and a High Court ruling that renovation, rationalization, or mechanization cannot be allowed at the expense of labour. Net profit for the year to March 31, 1959, was £131,209 (£134,864) and the dividend is maintained at 10 per cent.

METAL INDUSTRIES, LIMITED—In order to reduce the disparity between interim and final payments, the directors are raising the current year's interim to 6 (4) per cent. They forecast an increase of 1 per cent. on the 14 per cent. total, provided present trends continue. Group profits for the half year to October 17 are £850,000 (£679,000), tax is estimated at £414,000 (£356,000), and the balance is £436,000 (£323,000).

TRIPLEX FOUNDRY, LIMITED—Mr. W. H. L. Harrison, chairman, reports that with the ferrous foundry gathering momentum, earning capacity is increasing. The outlook for the non-ferrous side is a little clouded at the moment, for, although order-books are full, the price of secondary aluminium ingots continues to rise and with every increase the profit margin tends to fall. Generally, however, the group is well placed for business.

BELLISS & MORCOM, LIMITED, engine and turbine builders, etc., of Birmingham—In view of the first six months' trading, the directors do not feel justified in distributing more than a 3 (4) per cent. interim. They consider, however, that the full year's results to March 31, 1960, could be comparable with those of the previous year. For 1958-59 a final dividend of 4 per cent. was accompanied by a 2½ per cent., net, capital distribution.

BROOM & WADE, LIMITED, manufacturers of air compressors and pneumatic tools, etc., of High Wycombe—A one-for-two scrip issue is proposed to ordinary stockholders registered February 3. The dividend is effectively raised to 22½ per cent. with a 20 per cent. final for the year ended September 30, 1959. Group profits rose to £851,858 (£569,434), tax accounts for £415,935 (£306,259), and the net profit is £435,923 (£263,175).

H. W. KEARNS & COMPANY, LIMITED, machine-tool makers, etc., of Altrincham (Ches)—Even if trade does not improve further, says the chairman, Sir Harry W. L. Kearns, results for the current financial year should be similar to those for 1958-59, and the directors hope to be able to recommend the payment of similar dividends. The order-book at the end of September last still represented 11 months' work and in the last quarter orders were a little more plentiful.

YARROW & COMPANY, LIMITED, shipbuilders, engineers, and boilermakers, of Glasgow—Shareholders must not assume from the maintenance of the 17½ per cent. dividend for the year to June 30, 1959, on increased capital (an effective rise of 3½ per cent.) that the larger profit will necessarily be maintained. Group net profit was £315,646 (£199,518). During the last five years more than £1,000,000 has been spent on a general scheme of modernization and development which is now nearly complete.

FAIRFIELD SHIPBUILDING & ENGINEERING COMPANY, LIMITED—Improvement in results—the trading profit rose to £1,008,911 (£676,450) for the year to June 30, 1959—reflected the policy of ploughing back profits to enable all departments to utilize fully new and improved techniques. The company is a member of the Mitchell-Fairfield-Combustion Engineering consortium to develop marine nuclear propulsion and it is considered that the company could now undertake a nuclear propulsion unit "with confidence." The dividend is raised to 20 (10) per cent.

ANDERSTON FOUNDRY COMPANY, LIMITED—The board announces that as the capital employed in the business is very much less than has been required in recent years, it is proposed to repay to the shareholders 15s. per £1 share. It is also intimated that the directors have decided to await the full trading results for the year ending March 31, 1960, before considering the question of a dividend. There has been "a severe reduction" in the demand for one of the company's principal products and at the present time the works are operating considerably below normal capacity.

News in Brief

Mr. H. HUMPHRIES, managing director of Hadfields Limited, Sheffield, opened the Christmas Bazaar at Carbrook Church, Sheffield on November 28.

THE STAFF OF THE JOURNAL congratulates its esteemed contemporary, *Metal Industry*, on the attainment of its Golden Jubilee. A special issue of the magazine has been published to commemorate the occasion.

BECAUSE THEIR PRESENT PREMISES in Wolverhampton are not large enough, Frisky Cars (1959), Limited, are to move in the spring to a new factory to be built at Penkridge, Staffs. The firm has acquired 30 acres of land.

CARD CLOTHING AND BELTING, LIMITED, West Grove Mill, Halifax, Yorkshire, are arranging to arquire the while of the issued capital of Francis W. Birkett & Sons, Limited, brassfounders and engineers, Hightown Road, Halifax.

COLCHESTER LATHE COMPANY, Essex, one of the 600 Group of Companies, has over the last two months taken export orders to a total value of over £300,000. The machines are to go to 38 different countries.

EAST SUSSEX ENGINEERING COMPANY, LIMITED, Phoenix Iron Works, Lewes, Sussex, in order to give a better service to their customers in the London area, have opened an office at 270 Upper Tooting Road, London, S.W.17.

A YEAR AFTER ITS OPENING, the £3,000,000 Barrow-in-Furness factory of British Cellophane, Limited, is to be extended. About 100 additional workers will be employed when the new plant comes into operation about the middle of 1960.

THREE EMPLOYEES of Brightside Engineering Holdings, Limited, Sheffield, were presented with gold watches in recognition of their 50 years' service each with the firm, at the annual whist drive and dance at the Cutlers' Hall on December 2.

THE HEAVY PLANT DIVISION, Rugby, of Associated Electrical Industries, has secured an order worth £190,000 for a large turbine-driven centrifugal blower for a catalytic-cracking plant in the new Duque de Caxias Oil Refinery at Rio de Janeiro.

FLEMING & FERGUSON, LIMITED, shipbuilders, Paisley, are to supply the steam-propelling machinery for biggest grab-hopper vessel to be built for the Port of London. The dredger will be 264-ft. long, 45-ft. wide, and will have a hopper capacity of 2,000 tons.

VENEZUELAN IRON-ORE PRODUCTION during the first half of 1959 totalled 7,980,000 *tonnes*, of which 83½ per cent. were accounted for by the Orinoco Mining Company—a subsidiary of U.S. Steel Company—and 16½ per cent. by the Iron Mines Company of Venezuela (Bethlehem Steel Company).

SHEFFIELD AREA EMPLOYEES seem to be the most contented in the country, said Mr. S. H. Coplestone, home sales manager of W. and T. Avery, Limited, weighing and testing machines, at the annual dinner of the Sheffield branch social society in the Cutlers' Hall, Sheffield, on December 4.

INTERNATIONAL HARVESTER COMPANY, LIMITED, Doncaster, is providing their 3,000 employees with free anti-influenza vaccination. Because of absenteeism through influenza in previous winters the firm offered a vaccination service and about 70 per cent. of the employees said they would take advantage of it.

AT THE ELEVENTH ANNUAL DINNER of the supervisory staff of Sheepbridge Engineering, Limited, held on November 21, gold watches were presented to 15 men employed by Sheepbridge Equipment, Limited and Sheepbridge Stokes, Limited in recognition of completion of 25 years' service. This brings the total of presentations in the group to 543.

THE *Federation Europeenne de la Manutention* (European Mechanical Handling Federation) through its British national committee, 94/98, Petty France, London, S.W.1, has prepared a brief description of the activities and functions of the Federation, and this is available to readers on writing to the secretaries, Peat & Company at the above address.

MAJOR C. R. DIBBEN, chairman of Midland Aluminium, Limited, told shareholders in Birmingham, on December 3, that arrangements are now being made in conjunction with Aluminium Union, Limited, for the establishment of a company under the title Tower Aluminium (Nigeria), Limited, for the manufacture of holloware and other products in Nigeria.

A CONTRACT FROM NORWAY for a 108,000 kw rectifier installation, believed to be the largest of its kind yet ordered, has been obtained by the heavy plant division of Associated Electrical Industries, Limited. The order, which covers semi-rectifier equipment rated at 135,000 amps, 800 volts, d.c., has been placed by A/S Ardal og Sunndal Verk, the largest producer of aluminium in Norway.

A FACTORY for the production of cars for Common Market countries is to be built by Standard Triumph International, Limited, near Brussels, says Lord Tedder in his statement to shareholders. Plans have been approved and work is to start immediately. £6,000,000 is being spent on a new final assembly plant, new offices and the modernization of the engine gear-box and axle plant.

NATIONAL CARBON PHILIPPINES INC. has announced that the first Philippine-made ferro-alloys are being produced by the company's subsidiary, Maria Cristina Chemical Industries Inc. (National Carbon is an affiliate of Union Carbide International). These alloys are now available in commercial quantities from the firm's Iligan plant. They come in two types: 75 per cent. ferro-silicon and high-carbon ferro-manganese.

NEWTON CHAMBERS AND COMPANY, LIMITED, Thorncliffe, Sheffield, are to build a new chemical works and central laboratory block at a cost of £300,000. It will replace the existing Norfolk Works, and work on the site will begin early in 1960. The new works will cover an area of 92,520 sq. ft. and there will be a despatch bay of 10,000 sq. ft. Most of the new manufacturing plant will be made at Thorncliffe.

BRAYSHAW FURNACES, LIMITED, and Brayshaw Tools, Limited, West Gorton, Manchester, have now completed a large building programme consequent upon their operation as separate entities. New office accommodation has been made available and new layout and plant in the works departments. The managing director is Mr. W. G. Pallett, of Sheffield, formerly managing director of Laycock Engineering, Limited, Sheffield.

Mr. J. SPARK, works manager at the Doncaster works of British Railways, presented the original nameplate of the football-class locomotive, "Sheffield Wednesday," No. 61661, to the Sheffield Wednesday Football Club at a ceremony at the Royal Victoria Hotel, Sheffield, on November 25. The nameplate was burnished and inscribed. The locomotive was built at the Doncaster works before the war and has now been dismantled there.

TENANTS OF 130 COUNCIL HOUSES at Stocksbridge, near Sheffield, using coke-fired central-heating systems,

News in Brief

are being asked to comment on them in a survey to assist the Council in their consideration of the installation of central heating on the East Whitwell new housing estate. Mr. D. E. Robinson, the Stocksbridge surveyor, is preparing a statement of the comparative capital cost and running costs of gas, electric and water heating systems.

A NEW FACTORY for Moore & Wright (Sheffield), Limited, at Handsworth, near Sheffield, was opened by Sir Frank Lee, Permanent Secretary to the Board of Trade, on December 1. The new factory has nine roof bays each 525-ft. long by 31-ft. wide. Heating is provided by high-pressure radiant hot-water panels suspended from the roof. There is seating accommodation for 400 in the works canteen, and for nearly 100 in the staff dining room.

YORKSHIRE ENGINE COMPANY, LIMITED, Wincobank, Sheffield, has secured an order worth nearly £72,000 from the general chemicals division of Imperial Chemical Industries, Limited, for five 220 h.p. diesel-hydraulic locomotives. The order, gained in the face of strong competition after over three years' negotiations, is the first substantial one for these new model locomotives and the first for tandem working. They are to be delivered in 1960.

A TAKE-OVER OFFER is being considered by shareholders in the Harborough Construction Company, Limited, of Logan-street, Market Harborough, Leicestershire. About 200 workers are employed at the factory, where the National Aircraft Company started business in 1936. Subsequently the name was changed to the Harborough Aircraft Construction Company, Limited, and about 15 years ago the word "Aircraft" was deleted from the company's name.

THE SMITH TOOL COMPANY, of California, USA, have decided to take over a factory at Blantyre, Lanarkshire, and will employ initially 250 workers in the manufacture of bits for drilling industries. The company, leading manufacturers of drilling bits for the petroleum, mining and water-well drilling industries, will occupy a factory previously used by the development department of the Rolls-Royce aero-engine division, which has returned to East Kilbride.

SURIGAO CONSOLIDATED MINING COMPANY, Philippines, has acquired three copper and two iron properties, according to the company president, Mr. Otto F. Weber. The newly-acquired concessions are: Guimaras copper property, Pangasinan copper properties, Lluch copper property and Sta. Teresita and Pioneer Iron properties. Negotiations have been opened with a Japanese company to finance the development of the iron properties.

GEORGE TUCKER & COMPANY (SHEFFIELD), LIMITED, non-ferrous and ferrous metal stockists, 51, Norfolk Street, Sheffield, have opened a new warehouse in Shoreham Street, Sheffield. The firm traces its origins back to about 1786 when John Hoyland was a "factor and dealer in metal and steel" in York Street, Sheffield. The business was bought by George Tucker in 1840 and taken over by the Biggin family in 1876. The Tucker group now consists of five companies.

SIR CYRIL MUSGRAVE, chairman of the Iron and Steel Board, made a two-day visit to Sheffield on November 26 and 27, when he was the guest of Mr. Lewis Chapman, chairman of Jessop-Saville, Limited, and president of the British Iron and Steel Federation. Sir Cyril Musgrave also visited Steel Peech & Tozer, Rotherham, Firth-Vickers Stainless Steels, Limited, and the English Steel Corporation, Limited, and attended a dinner at which heads of steel firms were present.

WITH AN EXPORT TRADE already amounting to over £200,000 annually and covering some 27 countries, the Marshall Refractories Group, Sheffield, are further increasing their activities in the export markets. The firm now reports orders have been received to the value of £8,600 from Dominion Steel & Coal, Dominion Foundries & Steel and Canadian Steel Wheel. According to the company these orders indicate a readiness on the part of Canadian companies to buy British rather than from their nearest neighbours, the Americans, as has normally been the practice.

SPEAKING AT THE PRESENTATION of further education awards to employees of the English Steel Corporation, Limited, Mr. H. Parkin, education and training officer, said that the Corporation had increased its intake of school-leavers in Sheffield from 760 in 1956 to 880 this year. He also said that an extension of the training workshop, completed in the year, had enabled the company to provide training for 100 apprentices for a period of up to two years, and at the same time to give part-time training to 75 probationers. During the year, 520 young people had attended part-time courses, five had attended sandwich courses, four had been on full-time courses at university, and two had undergone full-time post-graduate courses. This was a vast change from 1956 when only two students attended part-time courses.

UNDER AN AGREEMENT with the Marion Power Shovel Company, Marion (Ohio), a division of the Universal Marion Corporation, Babcock & Wilcox, Limited, is to manufacture Marion excavators and cranes in several models at its recently acquired Dalmuir, Glasgow, works. The machines will be marketed and served by Blackwood, Hodge & Company, Limited, London, W.1. The Babcock & Wilcox factory at Renfrew is among the world's largest manufacturing plants devoted to the production of land and marine boiler plant and auxiliary equipment. Machine work, fabrication, and assembly will be carried out at the Dalmuir plant, which, prior to its acquisition earlier this year, had been producing armoured fighting vehicles and tanks for the Royal Ordnance Department. Since its acquisition by Babcock & Wilcox the facilities at Dalmuir have been extended and the plant has been producing industrial cranes, nuclear power plant, and other heavy equipment. Among the products of the Marion Power Shovel Company are diesel- and electric-powered shovels and cranes and draglines ranging in size from 3 to 4 yds. to the world's largest 65- and 70-yd. stripping shovels.

Recent Wills

FRASER, ALEXANDER, former vice-chairman and managing director of Girling, Limited, brake manufacturers, of Birmingham £47,873

THOMPSON, W. J., former chairman of the John Thompson, Limited, Wolverhampton, group of heavy engineering companies £44,396

COOPER, CHARLES, former joint managing director and head of the gas and chemical engineering division of W. C. Holmes & Company, Limited, Turnbridge, Huddersfield, an honorary life member of the Coke Oven Managers' Association ... £28,821

BUTTERFIELD, J. W., secretary of Leach & Thompson, Limited, iron and non-ferrous founders, of Keighley (Yorks) £2,727

HURST, DR. J. E., formerly managing director of Bradley & Foster, Limited, Darlaston (Staffs), and a director of the Staveley Coal & Iron Company, Limited, and other companies, past-president of the Institute of British Foundrymen, the Staffordshire Iron and Steel Institute, the British Cast Iron Research Association, and the Institute of Vitreous Enamellers, and founder Fellow of the Institution of Metallurgists £43,033

Baker Perkins Machinery at work . . . . . *at Peter Brotherhood Ltd.*

Peter Brotherhood Ltd. use this 'Cadet' Rotary Table Shot Blast Machine for a wide range of application at a high production rate. Note especially the control desk which includes signal lights, 24 volt current socket for inspection and ammeters indicating the shot output of the impeller. The wiring circuit is arranged for automatic operation to cut out human errors.

Please write for further details to:

BAKER PERKINS
Foundry Machinery Division
REDEWELL WORKS · HEBBURN ON TYNE · ENGLAND

BP/F2

HISTORICAL NOTE

Peter Brotherhood Ltd. were established in London in 1868. In 1907, the works was transferred to Peterborough, Northants. In their Foundry, they produce a wide range of general engineering castings for air and gas compressors, steam turbines, steam engines, refrigeration plant, water turbines, chemical filtration plants, textile machinery, brewery machinery, and many other applications

Personal

Mr. J. McNAY has been appointed a director of Federated Foundries, Limited. He will continue as secretary.

Mr. S. C. PEARSON, assistant general manager of the Consett Iron Company, Limited, has been appointed a director.

Mr. DOUGLAS A. SMITH has been appointed managing director of Weir Valves, Limited, a subsidiary of G. & J. Weir Holdings, Limited, of Glasgow.

After 51 years' service in the foundries of Newton Chambers & Company, Limited, Thorncliffe Works, Chapeltown, Mr. ADRIAN CROSSLAND has retired.

Mr. Peter Thomas, Parliamentary Secretary, Ministry of Labour, has appointed Mr. M. D. CRAIG to be his Private Secretary, in succession to Mr. K. R. COOPER.

Mr. F. R. BOND has been appointed a director of Worthington-Simpson, Limited, and continues as secretary. Mr. H. D. Jenvey has been appointed assistant secretary.

Mr. T. B. ELLIS has been appointed secretary of the General Electric Company, Limited. He succeeds Mr. T. B. O. KERR, who was recently appointed director for finance and administration.

Mr. J. O. CHARLTON has been appointed secretary, and Wing Commander J. L. DELL deputy chief test pilot of English Electric Aviation, Limited, a subsidiary of the English Electric Company, Limited.

Mr. R. H. COVERLEY, general manager of the Weyburn Engineering Company, Limited, has joined the board of the company. Mr. J. BLACK, works manager, will join the board on December 30.

Mr. JAMES GRAHAM, foreman of the despatch department, Goodwin Barsby & Company, Limited, St. Margaret's Ironworks, Leicester, has been installed as president of the firm's Quarter Century Club.

Mr. J. O. KNOWLES, a director of Metal Industries, Limited, has been elected chairman of the British National Committee of the International Electrotechnical Commission. He succeeds Colonel B. H. LEESON, who has resigned.

A Local Management Forum has been formed in Letchworth, Herts, and Mr. R. C. M. CALLAGHAN, personnel director of K. & L. Steelfounders & Engineers, Limited, has been elected chairman of the steering committee.

Mr. DAVID FARRAR has been elected to the board and appointed joint managing director of Ormerod Shapers, Limited, machine-tool manufacturers, Hebden Bridge, Yorks, a subsidiary of Asquith Machine Tool Corporation, Limited.

Mr. JAMES WILLIAM ELDRIDGE, Midland Regional Controller for the Ministry of Labour, is to retire at the end of the year. He will be succeeded by Mr. CLIFFORD J. GERMAN, Regional Controller for the East and West Ridings of Yorkshire.

The Society of Chemical Industry announces that the fifth Ivan Levinstein Memorial Lecture will be given by Mr. L. H. WILLIAMS on Friday, February 5, 1960, in Manchester. The title of the lecture will be "The Future of Chemicals from Petroleum."

Mr. HAROLD RIGGALL, managing director of Ruston & Hornsby, Limited, engineers, Lincoln, left by air on Sunday, November 22, for Bombay, to be a guest at celebrations for the centenary of Greaves Cotton, Limited, the company's agents in India.

Mr. J. T. W. DEWAR, managing director of Firth-Vickers Stainless Steels, Limited, Tinsley, Sheffield, presented gold watches to Mr. H. SPENCER and Mr. C. H. HAWKSWORTH on their completion of 50 years' service with the firm on November 27.

Tube Investments, Limited, announce that Mr. BRYAN HARRIS, a graduate in metallurgy from the University of Birmingham, has been appointed to a TI research fellowship for work in the physics and chemistry of solids, at the Cavendish Laboratory, Cambridge.

Dr. CHARLES SYKES, managing director of Thos. Firth & John Brown, Limited, Sheffield, has been appointed chairman of a working party to consider the amalgamation of the research organizations for cotton and rayon. He was also recently appointed to the Royal Ordnance Factories Board.

To increase their technical representation in Scotland, Sir W. H. Bailey & Company, Limited (Patricroft, Manchester) have appointed Mr. R. N. BARTLEY, North Eastern counties representative, to be responsible for Scotland also. His address is 79, Ravensbourne Avenue, East Boldon, Co. Durham.

SIR LESLIE ROWAN, a director of Vickers, Limited, has been appointed chairman of Robert Boby, Limited, a subsidiary of Vickers. He succeeds Mr. A. H. Hird, who has resigned as chairman and as a director of that company because of the extent of his other commitments within the Vickers group.

Mr. B. S. PRICHARD has relinquished his office as managing director of Patent Shaft Steel Works, Limited, of Wednesbury. He will in future be director responsible for sales and commercial development. Mr. BRYAN BRUCE-GARDNER, a director of the company, has been appointed general manager.

Mr. L. N. BOWLEY, production director of Crane's Screw & Colgryp Caster Company, Limited, Bordesley, Birmingham, has been elected the new chairman of the Birmingham area of the National Union of Manufacturers. Mr. A. N. WAIDE of Constructors, Limited, Erdington, has been elected vice-chairman.

MISS VALERIE M. THEADO has been appointed office manager for Brakeshoe International, S.A., Geneva, the newly-formed subsidiary of American Brake Shoe Company. Miss Theado has had 11 years' experience in the export department of Denison Engineering Division, of American Brake Shoe Company, at Columbus, Ohio, the products of which firm will be distributed in Europe through Brakeshoe International.

Mr. A. J. YOUNG, general manager of the English Electric Valve Company, Limited, has been elected to the board and appointed managing director. Mr. F. N. SUTHERLAND has been elected to the board. Mr. R. E. BURNETT, general manager of Marconi Instruments, Limited, has been elected to the board and appointed managing director of that company. Both companies are subsidiaries of the English Electric Company, Limited.

Mr. H. J. GRAVES has been appointed managing director of the British Motor Corporation (Australia) Pty. Mr. Graves, director of the Austin Motor Company, Limited, England, became joint managing director of BMC (Australia) together with Mr. GEORGE LLOYD last January. Mr. Lloyd will relinquish his position as joint managing director in the New Year, but will remain a director and will also act in a consultative capacity. Mr. NORMAN W. LAWRANCE has been appointed commercial director and Mr. R. L. ABBOTT, director of manufacturing. Mr. HAROLD SAINSBURY and Mr. LINDSAY SHIMMIN have been appointed associate directors.

Electrical Aids in Industry *Data Sheet* **No. 9**

Lighting-3

Data Sheet No. 7 dealt with some actual applications of factory lighting. Further applications are given here.

Drawing Offices

It is fair to say that in no part of a factory is good lighting more important than in the drawing office. The draughtsman's task is extremely exacting and unless the illumination is up to required standards, mistakes, loss of time and greater fatigue will result.

The essential requirements are :

High value of illumination
(*minimum of 30 foot-candles on the boards*)
Absence of shadows
Absence of reflections

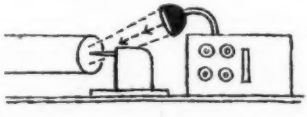
One of the major problems is the reflection of the light sources by shiny tracing paper, instruments, set-squares, etc., and particularly by the extra-hard pencil leads often used. Another problem is that caused by the shadows ahead of T-squares and by the variety of angles at which drawing boards are set.

Fluorescent lighting is particularly suitable because of its comparative freedom from shadow, its natural colour and because it can be localised with respect to drawing boards to avoid reflections while at the same time giving enough light upward and sideways to satisfy the general lighting requirements of the office.

A lighting solution which has been successfully employed for tracing is to light from beneath and through the paper which is fixed on to a translucent panel, thus eliminating the problems of shadow and reflection.

Machine Shops

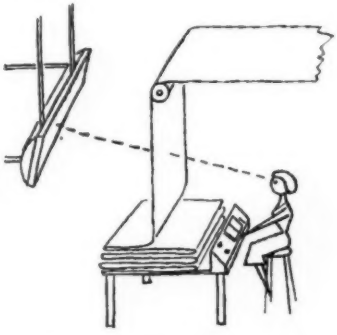
The problems of machine-shop lighting vary so widely that it is impossible to lay down rigid rules which are applicable to all types of machine. Certain maxims, however, have proved in practice to be satisfactory in various trades.



There is a strong case for the provision of local lighting on many machines to enable the direction of light to be varied to suit the work, or to boost the illumination for fine work.

In shops employing certain machine tools, particularly circular saws, the possibility of stroboscopic effects can be avoided by splitting lamps among the phases of a three-phase supply or by using twin lamp fittings with a split-phase circuit.

Where safety goggles are used, extra illumination should be provided to compensate for the reduced light reaching the eyes.



Silhouette inspection of fabrics or profiles can often be used to advantage by placing a light source behind the material to be inspected.

In general, machine-shop lighting is essentially an empirical science, based largely on a combination of general and local lighting, which offers immense scope for ingenuity.

For further information, get in touch with your Electricity Board or write direct to the Electrical Development Association, 2 Savoy Hill, London, W.C.2. Telephone: TEMple Bar 9434.

Excellent reference books on electricity and productivity (8/6 each or 9/- post free) are available—"Lighting in Industry" is an example.

E.D.A. also have available on free loan in the United Kingdom a series of films on the industrial uses of electricity, including one on industrial lighting. Ask for a catalogue.

7932-4

CUT HERE

Pig-iron and Steel Production

Statistical Summary of September Returns

The following particulars of pig-iron and steel produced in Great Britain are from statistics issued by the British Iron and Steel Federation. Table 1 summarizes activities during recent months. Table 2 gives production of steel ingots and castings in September. Table 3, weekly average production of finished steel in August. Table 4 gives the production of pig-iron and ferro-alloys in September, and furnaces in blast. (All figures are weekly averages in thousands of tons).

TABLE 1.—*Iron and Steel Price Index and General Summary of Pig-iron and Steel Production.*

Period.	B.o.T. Price Index, 1938 = 100			Iron-ore output.	Imported ore used.	Coke sent to blast-furnaces.	Pig-iron, ferro-alloys prod.	Scrap used in steel prod.	Steel (incl. alloy).			
	Iron and steel.	Coal.	Basic materials.						Imports.[1]	Prod. ingots, castings.	Delivrs. finished steel.	Stocks.[2]
1957	328	488	537	325	303	270	275	220	14	417	322	1,444
1958	343	503	478	276	262	227	245	196	9	369	284	1,542
1959—June[3]	338	487	475	285	232	204	235	214	9	388	292	1,425
July ..	338	486	472	275	226	201	222	169	7	320	245	1,436
Aug. ..	338	486	479	264	212	193	220	172	5	337	241	1,498
Sept.	338	486	480	288	259	212	251	231	7	426	—	1,463

TABLE 2.—*Average Weekly Production of Steel Ingots and Castings in September*, 1959.

District.	Open-hearth.		Bessemer.	Electric.	All other.	Total.		Total ingots and castings.
	Acid.	Basic.				Ingots.	Castings.	
Derbys, Leics, Notts, Northants, and Essex ..	—	4.6	15.0 (basic)	2.5	0.1	20.7	1.5	22.2
Lancs. (excl. N.W. Coast), Denbighs., Flints. and Ches	0.8	36.9	—	4.9	0.3	41.5	1.4	42.9
Yorks. (excl. N.E. Coast and Sheffield)								
Lincs.	—	47.7	—	—	0.1	47.7	0.1	47.8
North-East Coast	0.7	77.5	—	1.3	0.3	78.1	1.7	79.8
Scotland	1.4	40.0	—	2.5	—	42.2	1.7	43.9
Staffs., Shrops., Worcs. and Warwicks.	—	20.7	—	4.0	0.8	23.8	1.7	25.5
S. Wales and Monmouthshire	2.1	88.0	9.1 (basic)	0.9	0.1	99.8	0.4	100.2
Sheffield (incl. small tonnage in Manchester) ..	8.9	35.1	—	13.6	0.3	56.2	1.7	57.9
North-West Coast	0.1	—	5.4 (acid)	0.6	0.1	6.1	0.1	6.2
Total	14.0	350.5	29.5	30.3	2.1	416.1	10.3	426.4
August, 1959	6.9	284.9	24.1	19.6	1.6	329.4	7.7	337.1
September, 1958	17.5	306.5	21.2	21.1	2.3	358.1	10.5	368.6

TABLE 3.—*Deliveries of Non-alloy and Alloy Finished Steel.*

Product.	1956.	1957.	1958.	1959.	
			August.	July.	August.
Non-alloy steel:					
Ingots, blooms, billets, and slabs[4]	4.7	5.0	3.1	4.2	4.7
Heavy rails ..	0.7	11.2	6.8	5.7	4.0
Sleepers	1.1	1.3	0.3	0.1	0.4
Fish and soleplates	0.7	0.8	0.5	0.5	0.2
Plates:					
(i) Over ⅜ in. thick ..	30.3	34.0	27.6	16.0	21.6
(ii) Under ⅜ in.	19.9	20.3	15.2	16.2	17.7
Other heavy prod.	50.3	53.0	29.5	28.5	37.7
Ferro-concrete bars	7.8	8.9	6.0	10.5	8.6
Wire rods	22.9	23.3	16.8	17.8	18.4
Arches, etc. ..	10.1	11.0	7.2	5.7	7.0
Other light sections	41.4	38.7	21.4	26.6	25.9
Bright steel bars ..	8.0	7.0	4.5	6.6	6.4
Hot-rolled strip ..	24.5	23.1	16.5	23.3	19.5
Cold-rolled strip ..	7.5	7.1	4.8	7.1	6.2
Sheets incl. coated:					
(i) Hot rolled ..	15.0	13.0	8.6	11.2	10.7
(ii) Cold reduced	24.8	29.1	32.1	29.0	32.4
Tinplate:	31.8	18.8	12.9	23.8	11.1
Blackplate ..	1.3	1.0	0.5	0.9	0.3
Tubes up to 16 in.	26.2	22.1	15.4	19.0	16.7
Tube and pipe fittings	0.5	0.5	0.3	0.3	0.3
Tyres, wheels, axles	4.6	5.1	3.2	1.5	1.3
Forgings (excl. drop)	3.0	3.1	2.2	1.9	1.7
Steel castings ..	4.5	4.6	3.1	3.0	2.9
Tool and magnet steel	0.3	0.3	0.2	0.2	0.2
Total	335.0	342.3	238.7	259.6	255.9
Alloy steel	17.3	17.8	11.2	15.1	14.5
Total deliveries from UK production[5] ..	352.3	360.1	249.9	274.7	270.4
Add: Imported finished steel ..	19.5	9.6	5.0	8.0	5.9
	371.8	369.7	254.9	282.7	276.3
Deduct: Intra-industry conversion[6] ..	55.2	48.2	28.6	38.5	36.5
New material ..	316.6	321.5	226.3	244.2	239.8

TABLE 4.—*Production of Pig-iron and Ferro-alloys*

District.	Furnaces in blast.	Hematite	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derbys, Leices, Notts, Northants, and Essex	17	—	20.8	20.0	1.3	—	42.1
Lancs (excl. N.W. Coast), Denbighs, Flints, and Ches. ..	5	—	21.0	—	—	1.2	22.2
Yorks (excl. N.E. Coast and Sheffield)							
Lincs	8	—	40.5	—	—	—	40.5
North-East Coast	16	1.6	49.3	—	—	0.7	51.6
Scotland ..	5	0.5	15.2	0.6	—	—	16.3
Staffs, Shrops, Worcs, and Warwicks ..	4	—	6.8	0.9	—	—	7.7
S. Wales and Monmouthshire	11	1.7	47.1	1.1	—	—	49.9
Sheffield	2	—	3.5	—	—	—	3.5
North-West Coast	7	16.5	—	—	—	0.8	17.3
Total ..	75	20.3	204.2	22.6	1.3	2.7	251.1
August, 1959 ..	74	15.6	179.8	20.5	0.7	3.0	219.6
September, 1958	84	23.7	186.1	18.8	0.2	2.1	230.9

[1] Weekly average of calendar month.

[2] Stocks, mainly ingots and semi-finished, at the end of the year and months shown.

[3] Five weeks, all tables.

[4] Other than for conversion into any other form of finished steel listed.

[5] Includes finished steel produced in the UK from imported ingots and semi-finished steel.

[6] Material for conversion into other products also listed in this table.

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ALAG is a synthetic aggregate which, when used with CIMENT FONDU, PRODUCES CONCRETE WITH THE FOLLOWING UNIQUE PROPERTIES :-

EXTREME RESISTANCE TO ABRASION
(Hardness of aggregate 7·5 MOHS. Cuts glass)

ENORMOUSLY HIGH STRENGTH IN A MATTER OF HOURS
(For example 12,000 lb. per sq. inch at 24 hours and 16,000 lb. per sq. inch at 7 days)

HIGH DENSITY
(167 lb. per cu. ft. air-dried—20 lb. per cu. ft. higher than normal)

HEAT RESISTANT
(up to 1,150/1,200°C.)

OR ALL ABOVE PROPERTIES COMBINED

SHOULD BE USED ONLY WITH HIGH ALUMINA CEMENT (CIMENT FONDU)

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AP91

Raw Material Markets

Iron and Steel

Substantial demands for high-duty castings continue to be received by the engineering and speciality foundries. They provide sufficient work to enable most of the plants to obtain a satisfactory level of production. The motor vehicle trade continues to call for particularly large tonnages of castings. There is no sign of any reduction in demands from this trade and the orders at present on the books will keep the foundries fully occupied for many weeks. The engineering foundries supplying castings to many other trades, including heavy engineering, power and electrical plant manufacturers, agricultural implement makers, steelworks, etc., are receiving a good level of business, and those supplying to the machine-tool trade maintain improved outputs. From collieries and railways, however, demands for castings are no more than moderate.

The light-casting trade as a whole is working below capacity, although those works connected with the domestic utensil and the building trades are fairly well employed. Most of the jobbing foundries are obtaining steady outputs, but the textile foundries are only moderately employed.

Demands for pig-iron are concentrated mainly on the low-phosphorus irons. Another furnace in the Derbyshire area will shortly be producing this grade of iron, and this additional source of supply will be welcomed. Although in recent months additional brands of low-phosphorus irons have become available, some producers have been compelled to restrict sales to their regular customers by allocation. Consequently, heavier demands are being made on other suppliers. Demands for hematite and refined irons from these foundries have also increased. Deliveries of both these grades are coming forward satisfactorily. The call for high-phosphorus pig-iron is steady, and the light, jobbing, and some of the engineering foundries are able to obtain the required supplies without difficulty. Furnaces continue to export consignments.

There is a strong demand for arisings of good quality cast iron and steel scrap. Foundry coke deliveries continue to be satisfactory, while all orders for ganister, limestone, and firebricks are readily covered.

The re-rollers are very busy and most of them are obtaining substantial outputs from a full working week. There is a brisk demand for small bars and light sec-sections, while the call for reinforcing rods is maintained at a high level. The demand for steel semis is also maintained, and present requirements of steel billets, blooms, and slabs exceed the current outputs of the steelworks.

Non-ferrous Metals

The US copper position is changing slowly. The producers, following the lead of Kennecott, have raised their price 1½ cents to 33 cents a pound. This could, conceivably, be a prelude to Kennecott's agreement with the Mine-Mill Union with whom negotiations have been proceeding for some time and out of which it is believed that some provisional agreement has been reached. However, negotiations with the union and the other large US producers, such as Anaconda and Phelps-Dodge, are still considered to be only intermittent. All that being so, and the fact that the present strike, together with the Chilean dispute, has resulted in an estimated loss of production of around 250,000 tons, it is obvious that a critical shortage of metal in the US must be a reality sooner rather than later.

The general view in the US appears to be that the critical time will come early in the New Year and will be accompanied by a rise in the price levels. To some extent this opinion assumes either a settlement of the strike in the next few days or is based on the difficulty of working up production figures in a short time after the resumption of mining. In the short run, therefore, it will not matter too much whether the steelworkers walk out again on January 26. However, it will matter whether the longshoremen reach a settlement before the end of this month, which would see them over the 80-day "cooling-off" period.

The London market is still sensitive, but the trend of prices is very definitely upwards. Yet, rumours of *ad hoc* settlements in the States concerning the present copper strike unsettle the market immediately. This is somewhat of a pity as, although the present price level has outrun demand, the market is resting on a fairly firm basis. Stocks continue to fall and at the end of last week the amount of metal held in LME official warehouses was down to 5,897 tons. The feature of the market is the pressure on cash metal and the shortage thereof is reflected in the backwardation of around £15 over three months' metal.

Lead continues featureless, although the drying up of offerings from the Continent has had a steadying effect. In the US demand is patchy and the price unchanged at 13 cents a pound. Zinc in London continues steady and, with consumer interest concentrated on prompt metal, the backwardation has gone out to over £5 a ton over three months' metal. In the US demand is satisfactory and, if an overall settlement of the steel strike can be achieved before the present expiry date of the 80-day "cooling-off" period, the outlook is reasonably bright. Meanwhile, the East Louis spot price is unchanged at 12¼ cents a pound.

Tin has been a quiet market, waiting for consumer reaction towards raising of the tin quota for the first quarter of 1960 by 6,000 tons to 36,000 tons. This additional tonnage allowed exporters, represents more than 95 per cent. of the producers' capacity, and is more than was generally thought would be allowed. In London there is a definite resistance towards the price going too low. Singapore is experiencing brisk activity, but US demand is disappointing. It was thought and believed that the ending of the steel strike would mean a resumption of demand from the tinplate industry, but this has not as yet materialized. Tin stocks in London at the end of last week were lower by 208 tons at 7,977 tons. The US price is now only fractionally above 99 cents a pound.

Obituary

Mr. Richard Henry Daybell, formerly chief cashier of G. R. Turner, Limited, engineers and wagon builders, of Langley Mill, Notts, has died at the age of 78. He had been associated with the firm for more than 60 years, before his retirement in 1957.

Mr. James L. Chalmers, chairman and managing director of E. Chalmers & Company, Limited, metal merchants, Edinburgh, has died at the age of 69. He had been president of the National Association of Non-Ferrous Scrap Metal Merchants and of the Scottish Scrap Iron & Steel & Metals Association.

Mr. J. E. Fish, senior director of James Maude & Company, Limited, ironfounders and engineers, Sherwood Foundry, Nottingham Road, Mansfield, has died at the age of 82. Mr. Fish spent 68 years at the Sherwood Foundry, and was actively associated with the business until he was taken ill a few weeks ago.

You'll find British steel

in some shape or form

everywhere in the world.

The reason is simple: for British

steel men no order is too big,

too unusual or too difficult.

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Current Prices of Iron, Steel, and Non-ferrous Metals

(*Delivered unless otherwise stated*)

December 9, 1959

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2, 10-ton lots or over: Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.40 per cent. P, 10-ton lots or over, £23 5s. 0d., delivered Birmingham, £23 10s. 0d., delivered Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 6s. 6d.; South Zone, £25 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.: North Zone, £26 6s. 6d.; South Zone, £26 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent., 10-ton lots or over: N.-E. of England (local iron), £24 14s. 0d.; Scotland (Scotch iron). Zone S.1, £25 0s. 6d.; Sheffield, £26 2s. 6d.; Birmingham, £26 9s. 0d.; Wales (Welsh iron), £24 14s. 0d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leicestershire in 10-ton lots or over.

FERRO-ALLOYS

(*Per ton unless otherwise stated, delivered*)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £40 0s. 0d. to £42 10s. 0d., scale 15s. 0d. per unit, lumpy; 75 per cent. Si, £54 0s. 0d. to £57 10s. 0d., scale 15s. 0d. per unit, lumpy.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 10d* per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 11s. 7d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 14s. 7d. per lb. of W.

Ferro-chrome (6-ton lots and over, lumpy).—4/6 per cent. C, £77 0s. 0d. to £81 0s. 0d., basis 60 per cent. Cr, scale 26s. 0d. to 27s. 6d. per unit; over 6 per cent. C, £74 10s. 0d. to £77 10s. 0d., basis 60 per cent. Cr, scale 26s. 0d. to 27s. 6d. per unit; 2 per cent. C,* 1s. 7¼d. to 1s. 10¼d. per lb. Cr; 1 per cent, C,* 1s. 8d. to 1s. 11d. per lb. Cr; 0.15 per cent. C,* 1s. 9d. to 2s. 0d. per lb. Cr; 0.10 per cent. C,* 1s. 9¼d. to 2s. 0¼d. per lb. Cr; 0.06 per cent. C,* 1s. 9¾d. to 2s. 0½d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £245 0s. 0d.; 96/98 per cent., £275 0s. 0d.

Ferro-columbium.—65/67 per cent., Cb + Ta, 19s. 9d. per lb., Cb + Ta.

Ferro-manganese (Standard).—78 per cent., £63 10s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., 100 tons & over, £31 15s. 6d.; tested, 0.08 to 0.33 per cent. C, 6 to 35 tons, £33 15s. 6d.; hard (0.41 to 0.60 per cent. C), under 10 tons, £34 17s. 0d.; silico-manganese, under 10 tons, £43 16s. 6d.; free-cutting, under 10 tons, £36 14s. 6d. SIEMENS MARTIN ACID (under 10 tons): Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

Billets, Blooms, and Slabs for Forging and for Stamping (under 10 tons).—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

FINISHED STEEL

Heavy Plates and Sections (under 10 tons).—Ship plates, (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E. Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £39 1s. 0d.; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, 100 tons and over, £38 0s. 0d.; uncoated strip mill coils, hot rolled, under 3 mm. to 12g., 25 tons to under 50 tons, £43 16s. 0d.; black sheets (hand mill), 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £68 5s. 0d.

Alloy Steel Bars.—1 in. dia. and up; Nickel, £68 10s. 0d.; nickel-chrome, £99 4s. 0d.; nickel chrome-molybdenum, £111 17s. 0d., in lots of 5 tons to under 10 tons.

NON-FERROUS METALS

Copper.—Cash, £258 10s. 0d. to £259 0s. 0d.; three months, £242 0s. 0d. to £242 10s. 0d.; settlement, £259 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 4½d. per lb.; rods, 268s. 0d. per cwt. basis; 20 s.w.g., 303s. 0d. per cwt.

Tin.—Cash, £792 10s. 0d. to £793 10s. 0d.; three months, £789 10s. 0d. to £790 0s. 0d.; settlement, £793 10s. 0d.

Lead (Refined Pig).—First half December, £71 10s. 0d. to £71 12s. 6d.; first half March, £71 15s. 0d. to £71 17s. 6d.

Zinc.—First half December, £96 0s. 0d. to £96 2s. 6d.; first half March, £90 5s. 0d. to £90 7s. 6d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £130 0s. 0d.; rolled zinc (boiler plates), all English destinations, £127 15s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £107 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 2s. 0d. per lb.; sheets to 10 w.g., 216s. 3d. per cwt.; wire, 2s. 9½d.; rolled metal, 216s. 3d. per cwt.

Brass (Brazing).—BS1400, B3, £165; B6, £217.

Brass (High Tensile).—BS1400, HTB1, £199; HTB2, £215; HTB3, £229.

Gunmetal.—BS1400, LG2, £206; LG3, £215; G1, ½%, £271; G1, 1%, £257.

Phosphor Bronze.—BS1400, PB1 (AID released), £306; BS1400, 90/10/1, £282.

Leaded Phosphor Bronze.—BS1400, LPB1, £228.

Phosphor Bronze Strip, etc.—Strip, 306s. 9d. per cwt.; wire, 4s. 2½d. per lb.; rods, 3s. 6d.; tubes, 3s. 6d.; chill cast bars; solids 3s. 5½d.; cored 3s. 6½d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 11½d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 4½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 3½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 0d. to 2s. 3d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £71 10s. 0d. to £72 0s. 0d. Nickel, £600 0s. 0d. Aluminium, ingots, £180 0s. 0d.; aluminium bronze (BS1400), AB1, £252; AB2, £260.

* Average 68–70 per cent.